The Milbank Memorial Fund

QUARTERLY

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Vol. XX JANUARY 1942 No. 1

Edited by the Technical Staff

Published quarterly by the MILBANK MEMORIAL FUND, 40 Wall Street, New York, New York. Printed in the U. S. A. Subscription: $1.00 a year

IN THIS ISSUE

THE fundamental requirements of a program aimed toward eradication of tuberculosis include (1) case finding; (2) hospitalization; and (3) consideration of the social and economic problems of the tuberculous individual and his family. The article "The Importance of Family Problems in the Control of Tuberculosis" by Jean Downes and Clara R. Price describes the nature of the problems of the tuberculous family which are being encountered in the Harlem area of New York City. Hospitalization of the patient and problems of family income were of major importance to the public health nurse in her supervision of the family. The extent to which these and other socio-economic problems are being overcome or solved is presented. The results should be of value to public health workers who are interested in the control of tuberculosis.

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In an article "Australia's Population Problem," Dr. G. F. McCleary provides an interesting account of the demographic characteristics of Australia. The population is described as one with relatively high levels of living and with virtually no color problem. The outstanding problem to which the author devotes attention is that of the declining birth rate, a situation similar to that in other countries affected by Western cultures. The author, after long experience in the field of public health in England, has turned his attention to problems of population in recent years. He has had first-hand acquaintance with Australia. The article will be welcomed not only by students of population but also by individuals who wish to learn more about a sister democracy and important ally in the Pacific.

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A significant demonstration that the nutrition of the mother during the prenatal period influences not only the whole course of pregnancy but also affects the health of the child during the first months of life is reported on by J. H. Ebbs, F. F. Tisdall, and W. A. Scott in the article "The Influence of Prenatal Diet on the Mother and Child." Pregnancy makes heavy demands on the nutrition of the mother, and failure adequately to provide the added nutritional needs appears to be one important factor in the occurrence of complications during pregnancy and labor, and in the infant's susceptibility to illness.

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The question of the relation of maternal age to intelligence of offspring is one with ramifications in the fields of biological and social science, but actual studies of the problem have been few. In an article, "Social Environment as a Modifying Factor in the Correlation between Maternal Age and Intelligence of Offspring," Dr. Pearl Moshinsky presents results from her study of over 4,000 school pupils in London. Two groups were analyzed separately: (1) The "free pupils," mainly from homes of manual workers; and (2) the "fee-payers," mainly from families of higher occupational status. Among the "fee-payers," but not among the "free pupils," mean intelligence scores tended to increase with advancing maternal age. The results confirm the author's hypothesis that social environment should be taken into account in studies of this type because the conditions responsible for late maternal ages are not the same in different social strata.

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Nutritive values in diets of over 2,000 adolescent children are appraised in the article "Diets of High School Students of Low-Income Families in New York City" by Dorothy G. Wiehl. In this report from the cooperative study on Medical Evaluation of Nutritional Status, the dietary intake of the individual child of eight essential food elements is compared with amounts recommended as needed to ensure good nutritional status. It was found that from slightly more than one-half to about three-fourths of the group had diets furnishing less than recommended allowances of vitamins A, B_1, B_2 and C, calcium, iron, and calories. Pro-

tein was consumed in more adequate amounts. Diets of many of the children were deficient by more than one-third of the allowance. Thus, 38 per cent had less than two-thirds of the vitamin A allowance; slightly more than one-fourth of the group were similarly deficient in vitamins B_2 and C and calcium; and one-fifth had less than two-thirds of their estimated calorie requirement. A high prevalence of subclinical deficiency conditions among these children has been reported in previous articles in the *Quarterly*. The need for an effective program in high schools for the improvement of dietary habits seems well established.

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If the high dietary requirements of the adolescent, growing child are to be fully met, every meal should furnish its full share of all essential nutrients. School cafeterias, therefore, have a responsibility to make available nutritious lunches. Since the vitamins and calcium are the most common nutritional deficiencies, lunches that are rich in these nutrients are especially valuable for improving the nutritive level of diets. Suggestions for school lunches are made by Emily K. Stamm and Dorothy G. Wiehl in the paper entitled "The School Lunch as a Method for Improving the Diets of High School Students."

THE IMPORTANCE OF FAMILY PROBLEMS IN THE CONTROL OF TUBERCULOSIS[1]

JEAN DOWNES AND CLARA R. PRICE, R. N.

THE outstanding tuberculosis problem in New York City is the control of the disease among Negroes. Their mortality from tuberculosis was 220 per 100,000 in 1940 compared with a rate of 43 among white persons.[2] If eradication of tuberculosis is to become more than a hope, serious consideration must be given to those population groups where the problem is acute. With these facts in mind, a special study of tuberculosis was started April 1, 1939 in the upper part of Harlem. It is hoped that this study will point the way to the most effective public health procedures for the control of the disease among the Negro population of New York.

The fundamental requirements of a program aimed toward eradication of tuberculosis include (1) case-finding; (2) hospitalization; and (3) consideration of the social and economic problems of the tuberculous individual and his family. This report deals particularly with the problems of the tuberculous family which are being encountered in Harlem, their nature and the extent to which they are being overcome or solved.

DATA AND METHOD OF STUDY

The special study was set up in an area of Upper Harlem, comprised of some thirty-five city blocks. Thirty-two thousand Negroes in 8,500 household units live in this area.[3] The families of all active or recently active cases of tuberculosis in the area are being given intensive public health nursing and clinic supervision.

[1] From the Milbank Memorial Fund, the Community Service Society, and the New York City Department of Health.

Presented at the Annual Health Conference of the Philadelphia Tuberculosis and Health Association, November 18, 1941.

[2] The rate 220 per 100,000 includes Negroes and other colored. From "Net Tuberculosis Mortality, 1940"; the New York Tuberculosis and Health Association.

[3] Data from the residential census, Real Property Inventory—City of New York—Borough of Manhattan, Residential Report, 1934.

Dr. Herbert R. Edwards, Director of the Bureau of Tuberculosis, is medical director of the study. The medical staff of the tuberculosis clinic is provided by the Department of Health. The nursing and clerical staffs are provided by the Community Service Society. The nurses represent the Department of Health and are responsible for the public health nursing care of the tuberculous patients and their families. The nurses who do the home visiting also serve in the clinic.

The emphasis in this study is being placed upon the family. The clinic is primarily to serve the tuberculous family. Its other activities include a consultation service for private physicians and case-finding among individuals who voluntarily apply for an examination. However, the bulk of clinic service is used by those persons who have lived in intimate contact with infectious tuberculosis.

A definite effort is being made to preserve the family unit which otherwise might be broken up by the disability and hospitalization of its tuberculous members and to preserve the health of the contacts. Obviously, the clinic physician and the public health nurse have an important part to play in this effort.

Detailed records concerning the social and economic condition of each family are being obtained by the nurses and the families are visited at fairly frequent intervals in order to note any changes in these conditions. The data being collected are as follows: The persons who make up the household are listed. The place and date of birth, length of residence in New York City, present employment status, and relationship to the head of the household are indicated for each person in the household. Cause of death, place of death, and date of death are listed for all deceased members of the family. Nature of employment is procured for all employed persons. Data are being obtained also as to the amount and source of income, and the amount paid for rent. At monthly intervals information is obtained concerning the amount spent for food and the types of food eaten by the family during the preceding week.

Attention is given to all health problems in the family. Persons suffering with chronic disease other than tuberculosis are listed and a record is obtained of medical care, both clinic and private physician's care, received by them.

These detailed records for each family were devised to serve a dual function. First, they were to afford a fairly accurate picture of the social and economic environment, and of the health problems in the family, all of which must be considered if effective control of tuberculosis is to be accomplished. Second, they were to form a point of departure for public health teaching by the nurse, since they may indicate certain outstanding problems in each family. For example, the nurse is asked to go over carefully the information which she has obtained for each family under her care and to set down on the nursing record the problems which she notes and which must be considered on her next visit to the family. The effectiveness of her teaching is determined in part by her progress in solving the problems which she has outlined.

The Tuberculosis Problem in the Family

Preliminary to a description of certain aspects of the environment of the tuberculous families and to an evaluation of the effectiveness of the first two years' efforts in the control of the disease, it is important to indicate briefly the seriousness of the tuberculosis problem among them.

One hundred and forty-four families or households, observed one month or longer, have formed the study group. The period of observation has varied from one to twenty-four months. These families are representative of the 8,500 households from which they are drawn in respect to average size. The average size of the 144 households was the same as the average for the households of the entire area, namely, 3.8 persons per household. The average amount of rent, $33 per month, was somewhat lower than the average ($37) for the area as a whole. The degree of crowding was greater in the tuberculous families. Twenty-four per cent of the 8,500 households

had more than one person per room; 40 per cent of the families in the special study had more than one person per room.

Most of the families have been recently exposed to infectious tuberculosis. In approximately 75 per cent of the 144 families the index case, that is, the tuberculosis case which brought the family into the study, had, or had recently had, demonstrable tubercle bacilli in the sputum.

It is important also to draw attention to the fact that the population of the district is an extremely mobile one. According to census data collected when the Real Property Inventory was made in New York City in 1934, 50 per cent of the families in the area of Harlem being studied reported that they had lived less than a year in their present living quarters.[4] The 144 tuberculous families constituting the special study group and drawn from this population had the same moving rate, that is, 50 per 100 per year. Effective public health supervision of the family is more difficult to accomplish under these circumstances than would be the case in a more stable population.

In evaluating the work of the first two years of study in Harlem it is suitable to divide the 144 families into two groups: (1) those observed or supervised less than twelve months, and (2) those observed twelve months or longer. There were 50 families, including 192 persons, in the first group designated as Group 1 and 94 families, including 417 persons, in Group 2.

The two groups of families were fairly similar with respect to the possibility of exposure of their members to a case of infectious tuberculosis. In 75 per cent of the families the index case was known to have, or to have had, a positive sputum.

The index case, that is, the case which brought the family into the study, was either the husband or the wife in approximately 50 per cent of both groups of families. This fact is important because

[4] Data from the residential census, Real Property Inventory—City of New York—Borough of Manhattan, Residential Report, 1934.

the problem of stabilizing the family and of preserving its unity is greatly affected by the individual ill with tuberculosis, especially if that person has responsibilities as a wage-earner or as a housewife. In the remainder of the families the index case was a son or a daughter or other blood relative of the head of the household or of the wife.

Family Problems Other Than Tuberculosis

Because of the infectious nature of tuberculosis, the problem of control of the disease is concentrated in the immediate environment of the positive sputum case, that is, in the family or household unit. It is believed also that the most effective public health work in the family can be accomplished only with an understanding of the general health, social, and economic situation of the family. It was for this reason that detailed information concerning the presence or absence of problems in these categories was recorded for each family.

Chronic Disease. The nurses were to inquire about chronic disease other than tuberculosis among the nontuberculous members of the family. Table 1 shows the chronic conditions reported for each group of families. Approximately 40 per cent of the families in

Table 1. Number of families with chronic condition other than tuberculosis.

Type of Chronic Condition or Impairment	Group 1 (50 Families)			Group 2 (94 Families)		
	Total Families	Total Cases of Chronic Disease	Cases Under Medical Care	Total Families	Total Cases of Chronic Disease	Cases Under Medical Care
Total Chronic Cases	19	20	9	52	56	36
Syphilis	8	8	5	24	26	16
Diseases of the Heart and Arteries	6	6	2	13	14	8
Arthritis	1	1	0	5	6	4
Diabetes	0	0	0	3	3	3
Hernia	1	1	1	2	2	1
Gastric Ulcer	2	2	0	2	2	2
Mental Disease or Mental Deficiency	1	2	1	3	3	2

Group 1 reported a case of chronic illness; in Group 2 slightly more than 50 per cent reported the presence of chronic disease. Syphilis was the leading cause of chronic illness with diseases of the heart and arteries second in importance. It should be emphasized that cases reported by the family are only those causing disability. An examination of all members of the family, for example, for syphilis or heart disease would undoubtedly reveal more cases. When these data are considered in relation to disability from tuberculosis in these families, it is apparent that they carry a very heavy burden of illness. Furthermore, with the exception of mental deficiency and rheumatic heart disease, these conditions, including tuberculosis, are generally peculiar to adults. This means that an exceedingly high proportion of the ordinarily productive members of the family were partially or wholly incapacitated.

Since the public health nurse is concerned with the health problems of the entire family, it is gratifying to note that 36 of the 56 cases in the Group 2 families were under medical supervision. In the families observed less than twelve months, Group 1, less than half of the reported cases had medical care, either private physician or clinic care.[5]

General Health, Social, and Economic Problems. In addition to the record of chronic illness, the nurses were to indicate other problems in the family and to indicate also what she had done about them. For convenience in analysis the problems have been allocated to the following broad categories: (1) "general health problems"; (2) "economic"; and (3) "social problems." Theoretically and actually, these categories are not mutually exclusive; a health problem may bring about a socio-economic problem. However, no effort will be made to trace or designate cause and effect. The categories are used simply for the sake of convenience and because they help to distinguish the nature of the problems.

General health problems include poor food habits or poor health

[5] In only three instances medical care was secured through the assistance of the nurse.

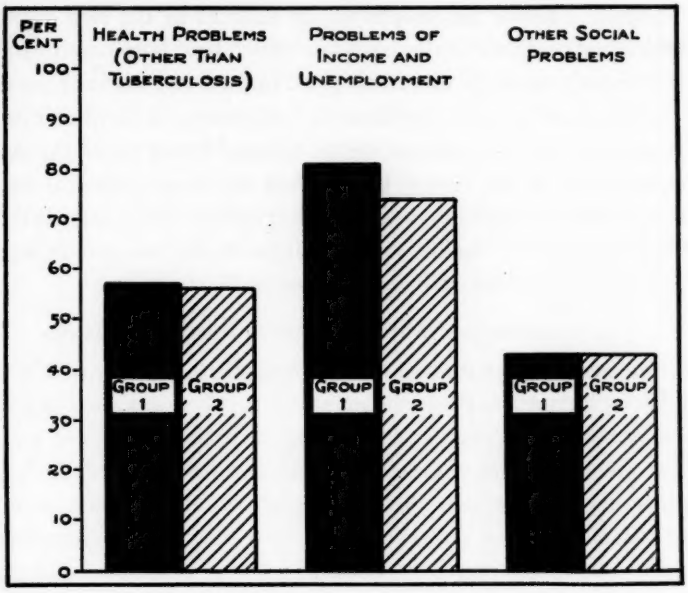

Fig. 1. Proportion of families in which there were socio-economic problems.

habits; the need for examination at a venereal disease clinic for contacts of a syphilis case; the need of hospital care, both temporary and custodial, for chronic-disease patients (nontuberculous); the need for dental care or eye care; medical supervision of prenatal cases; and the need for surgical care for acute conditions.

Economic problems are entirely those of inadequate income and unemployment.

Social problems include housing, such as inadequate living space or crowding, violations of the housing regulations, and poor housekeeping; inadequate supervision of the children in the family due to illness of the mother or to her employment outside the home; personality difficulties, such as emotional instability and behavior problems; and problems arising from unwanted illegitimate children.

Figure 1 shows the proportion of families in the two groups which had problems in the categories which have been described. It is strikingly apparent that inadequate income and unemployment were the most frequent problems in both groups of families. From 75 to 80 per cent had such problems.[6] General health problems were recorded for 57 per cent of the families and social problems were noted by the nurses in 43 per cent of the families. It is of interest that the proportion of families with problems in the two groups were generally similar for each classification of these problems.

Accomplishment With Respect to Family Problems

The next point of interest is, what were the nurses able to accomplish with respect to the problems which they had indicated as present in the family? Figure 2 shows for each classification of problems the proportion of families in which an improvement or complete solving of the problem was brought about during the period of observation. It is clearly apparent that the rate of accomplishment was much higher in families (Group 2) observed twelve months or longer. In 74 per cent of these families the economic situation was improved either through increased employment, where there was an unemployment problem, or through adjustment of the income to a more adequate level. Only 26 per cent of the families in Group 1, in which there was an economic problem, showed improvement. The rates of accomplishment in modifying health and social problems in the Group 2 families were 50 and 53 per 100 families compared with 37 and 28, respectively, in the families observed less than twelve months.

The differences in the accomplishment in the two groups of families suggest that the length of time of supervision is important. However, families in which supervision has been most successful tend to remain under supervision. The mean period of observation for the Group 1 families was five months, the shortest period one

[6] When first visited, 50 per cent of the families were receiving some form of public assistance.

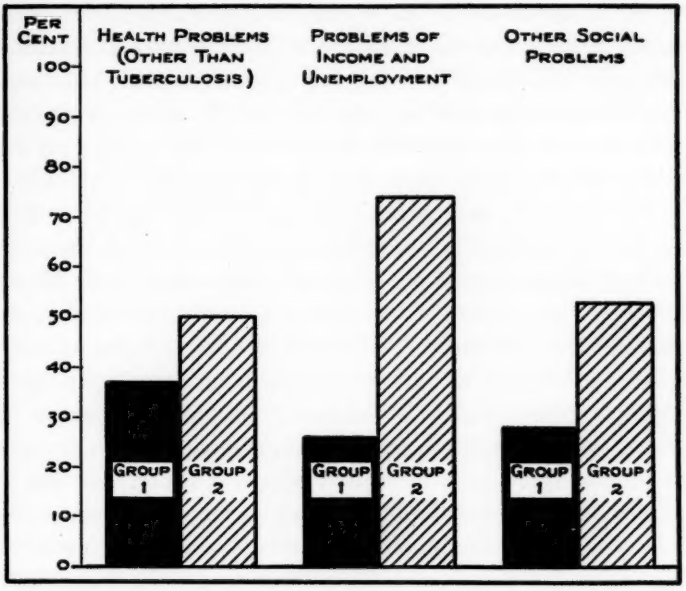

Fig. 2. Proportion of families in which there was definite accomplishment in solving their problems.

month, and the longest possible period of supervision was eleven months. In the 94 families in Group 2 the mean period of observation was eighteen months, and 27 per cent of the total number were observed twenty-three to twenty-four months. The families in Group 1 for the most part represent the families in which supervision ended, either because the family moved from the area of study or, in a few instances, was broken up because of tuberculosis and the members scattered to various parts of the City. It may be concluded that when tuberculosis occurs in the Negro families, prompt action by the health and welfare agencies is necessary to stabilize the family and to preserve its unity.

It is important to indicate more specifically how improvement in the family situation was brought about.

The Economic Situation. When the economic situation of the family at the beginning of the period of observation is considered, 50 per cent of all families were receiving some form of public assistance, chiefly home relief or work relief. At the end of the period of observation, 62 per cent of the families in Group 1 and 73 per cent of the families in Group 2 were receiving public assistance, or an increase of 24 and 46 per cent, respectively. The level of the income for all families is illustrated in Table 2, which shows the median annual income per adult cost unit according to the size of family. Size of family and income are expressed in adult cost units because this method allows for the relative cost of maintenance of children and adults. It is apparent that, in general, in both groups of families the median annual income per unit decreases as size of family increases. Comparison of the two groups of families by specific size is hardly appropriate because in some instances the number of families involved is exceedingly small. The important point brought out by this table is the level of the standard of living of these families as reflected by income. Standards of income for maintenance and for an emergency level of living have been worked out for families of the working class in New York

Table 2. Median annual income per adult cost unit in two groups of tuberculous families.

Size of Family in Adult Cost Units	Group 1		Group 2		Number of Families	
	Median Annual Income per Adult Cost Unit	Average Deviation from Median	Median Annual Income per Adult Cost Unit	Average Deviation from Median	Group 1	Group 2
1.00 or Less	$644	$125	$938	$280	4	6
1.40–2.74	413	124	350	129	21	38
2.75–3.99	332	209	294	71	17	22
4.00–6.49	167	38	305	112	3	19
6.50 and Over	*		182	22	1	3

* One family annual income per adult cost unit $288.

City.[7] In multiple-person-family units, with one exception, the median annual income was below the maintenance level of $390 per adult cost unit. The median incomes of the families studied were slightly above the emergency level of living, which was $279 per adult cost unit, except for those of relatively large size.

Examples of the adjustment of income which was made in families with the assistance of the nurse are as follows: Public assistance, that is, home relief, was secured for families where there was need for it; an additional allowance for food was secured for home relief families when the investigator from that agency felt that it was justified; clothing, blankets, and other household necessities were supplied by home relief when there was an unusual need for them. Families where the husband was ill or had died of tuberculosis were shifted from home relief to assistance from the Bureau of Child Welfare if there were a sufficient number of children under working age in the family to bring about an increase in income over that afforded by home relief. Table 3 shows the difference in the income levels for the different types of relief. It should be emphasized that

[7] The standards used were arrived at by the Research Division of the Works Progress Administration and were based on studies of the cost of living in March, 1935.*

These standards were based on a four-person manual worker's family, husband, wife, and two children of school age. These standards in terms of adult male units were: for maintenance $390 per unit per year (excluding rent $305), for emergency living $279 per unit per year, and excluding rent $194.

At the maintenance level, these four persons live in a four or five-room house or apartment with water and sewer connections. Their dwelling is in at least a fair state of repair and contains an indoor bath and toilet for their exclusive use. They have gas, ice, electricity, and a small radio, but no automobile. They read a daily newspaper, go to the movies once a week, and enjoy other simple leisure-time activities. Their food is an adequate diet at minimum cost. They pay for their own medical care. Clothing, furniture, furnishings, and household equipment are provided with some regard for social as well as material needs. Carfare, taxes, and numerous incidental expenses are included in their budget.

At the emergency level this four-person family has cheaper kinds of food to secure the same nutritive values as the maintenance budget provides. Housing is less desirable. There is less frequent replacement of clothing, furniture, furnishings, and household equipment. Household supplies are less plentiful; other services are reduced in quantity or eliminated entirely.

It is of interest to note that a more recent study of the cost of living has been made. In *The New York Times* of June 8, 1940, the Citizens Bureau of Governmental Research announced that the annual living cost of a four-person family of a manual worker in New York City averages $1,412. In the 1935 WPA study the average for the same type of family in New York City was $1,375.

* Stecker, Margaret Loomis: Intercity Differences in Costs of Living in March, 1935, 59 Cities. Works Progress Administration, Division of Social Research. Research Monograph xii, 1937.

Type of Public Assistance	Group 1		Group 2		Number of Families	
	Median Annual Income per Adult Cost Unit	Average Deviation from Median	Median Annual Income per Adult Cost Unit	Average Deviation from Median	Group 1	Group 2
Home Relief	$250	$123	$279	$ 89	18	30
Work Relief	377	25	308	127	3	9
Bureau of Child Welfare Aid	291	28	314	81	4	18
All Other Assistance	429	85	292	112	6	12

Table 3. Median annual income per adult cost unit in two groups of tuberculous families receiving public assistance.

the Home Relief Bureau has been cooperative in bringing about an adjustment of the economic situation of the family when their attention was called to it by the nurses. However, there is a limit to the amount of assistance that can be given by the Home Relief Bureau.

Emergency assistance was given by the Community Service Society, a private agency, to 50 per cent of the families observed twelve months or longer and to only 12 per cent of those observed less than twelve months. This assistance was temporary. For example, money for rent and food was supplied to some families until public assistance was secured for them; milk and cod-liver oil were supplied to families where the food budget could not possibly provide these necessities for the children; clothing was supplied in instances where there was an emergency situation. During the first two years of the study, the amount spent for these purposes was approximately $2,200. Such emergency assistance has played a part in the stabilization of the family which is so important in tuberculosis control.

General Health Problems. The accomplishments in solving the general health problems included improvement in food habits, dental care was secured where needed, clinic care of prenatal cases

was secured, and hospital and medical care were secured for chronic and acute illnesses where the need was greatest. There were also failures with respect to problems in all of these categories.

Social Problems. The only family problems in this group where there was progress in solving them were those of housing and inadequate supervision of the children. Violations in the housing regulations were brought to the attention of the landlord and were corrected; better living quarters were found for families where the crowding was greatest, and special attention was given to these conditions when the tuberculous patient was in the home. Improved supervision of the children of ill or working mothers was arranged through the assistance of a WPA housekeeper. Nothing was done about problems, such as personality difficulties, which included emotional instability and behavior problems, and which demand skilled social case-work treatment. They were recorded by the nurse but no social case-work agency was called in to assist. Some of these problems were especially serious because of their bearing upon family stability and health.

Problems Missed in the Tuberculous Families

So far the discussion of family problems has included those noted and recorded by the nurse. From the records it is possible to detect some which were missed and about which nothing was done. In the families supervised less than twelve months there were missed problems in one out of every three families and in those supervised twelve to twenty-four months, one out of every six or seven families had a problem which the nurse failed to note or to do anything about. Most of these were health problems which were revealed through hospital and clinic records contained in the family folder. Some were failures to check additions to the household, such as the return to the home of a patient from a mental institution, or the return of a tuberculous patient from the sanatorium, or failure to do anything about an apparent need for emergency assistance.

Problems Concerning the Tuberculous Patient and the Examination of Contacts

Patient Problems. The foregoing discussion has dealt with general health and socio-economic problems of the family. Since there were forty living index cases of tuberculosis in the fifty families in Group 1 at the time of the first visit to the family and seventy-two in the ninety-four families of Group 2, there were in some of these families problems which particularly concerned the tuberculous patient. These were in order of importance: need for hospitalization (a first admission or a readmission) and need for adequate rest and better diet. In the families observed twelve to twenty-four months (Group 2), 84 per cent of such problems were satisfactorily solved. In the fifty families with a relatively short period of supervision, only 32 per cent of the "patient problems" ceased to be problems before discharge of the family.

Examination of Family Contacts. Every effort was made to encourage all contacts in the families under supervision to have a clinic examination including an x-ray of the chest. Seventy-nine per cent of those in the families observed twelve to twenty-four months were examined, compared with 60 per cent in the families observed less than twelve months.

The solving of patient problems and the relatively high proportion of family contacts examined are achievements which merit some emphasis. From the data presented, it is evident that these problems and also problems of income were of major importance to the public health nurse in her supervision of the tuberculous families. However, the results shown in this study were accomplished with from eighteen to nineteen home and office visits per family per year.

The Secondary Attack Rate of Tuberculosis

One of the ultimate tests of the effectiveness of control procedures in tuberculous families is their effect upon the secondary attack rate

among those at special risk of contracting the disease. During the first two years of study the average annual attack rate in the 144 families has been 2.2 cases per 100 years of life. This rate is almost identical with the rate 2.3 per 100 noted during the first two years after exposure to tuberculosis in the Negro families studied by the Henry Phipps Institute in Philadelphia.[8] Whether or not we shall be able to modify the secondary attack rate in Harlem families as the study progresses is a question.

An important question raised by this report has been fittingly answered by Dr. Wade H. Frost. It seems suitable, therefore, to conclude with a quotation from an address of his:[9]

> How far the tuberculosis control program should extend in the direction of general social betterment is a question which, perhaps, need not be answered. Probably nothing has been more influential in bringing about the decline of tuberculosis than progressive improvement in the social order as a whole; and nothing, perhaps, is more essential to the further effective control of the disease than to hold up, and so far as possible to improve, the standards of living of the lower economic strata. Obviously, the tuberculosis control program cannot expand to include the whole scheme of social betterment; but it can, and I think it should, be concerned with raising the standards of living of those groups who are in most imminent danger of tuberculosis, beginning with the families of the tuberculous, and extending thence as far as practicable.
>
> As regards the families of persons suffering with open tuberculosis, I think a clear distinction should be made between the kind of public aid given them and that which is given generally to the poor who are disabled. For if we are to require the isolation of open tuberculosis as a matter of public protection, it becomes a public responsibility to bear not only the cost of medical care, but the whole cost to the patient's family, or as large a share as may be required. Moreover, it should be

[8] Putnam, Persis: Tuberculosis Incidence Among White Persons and Negroes Following Exposure to the Disease. *The American Journal of Hygiene*, November, 1936, 24, No. 3, pp. 536-551.

[9] Frost, Wade H.: How Much Control of Tuberculosis? *The American Journal of Public Health*, August, 1937, 27, pp. 759-766.

recognized that what is needed is not bare maintenance on a minimum or average "relief" standard, that it is not sufficient merely to prevent their dropping lower in the economic scale; it may often be necessary to raise them to a higher level. The two conditions which most favor tuberculosis are intimate exposure and poverty. Where these two meet is where double protection is needed, and it implies more than free medical care and hospital beds.

AUSTRALIA'S POPULATION PROBLEM

G. F. McCleary, M.D.

THE Australian Commonwealth comprises the island continent of Australia, with an area of 2,948,366 square miles, and the island of Tasmania, the total area of the Commonwealth being 2,974,000 square miles. This vast area is nearly equal to that of continental United States, 3,027,000 square miles. The interior of the island continent contains large tracts of land that are considered unsuitable for occupation by white settlers—there are about 1,067,000 square miles over which the annual rainfall is less than 10 inches—and white settlement has been concentrated chiefly on the eastern and southeastern seaboards and a small part of the western seaboard.

The peopling of Australia by settlers of European origin began in 1788, and by 1850 the colonists had increased from 850 to 405,000; though the rate of increase was high the numbers were small. In 1851, however, an event occurred which, it has been said, "precipitated Australia into nationhood"; large deposits of gold were found, and a gold rush began. By 1860 the population had increased to 1,145,000. In 1938 it was estimated at about 6,930,000.[1]

Though Australia is thinly peopled, the population has increased at a high rate. During the forty years 1881-1920, the average annual rate of increase, 22 per 1,000 population, was higher than that of any other country except New Zealand, which had a rate of 23 per 1,000. In the period 1921-1926 Australia's rate of increase was the highest in the world, and in 1926-1931 it was exceeded only by that of Canada.

Since the decade 1851-1860, which saw the beginning and end of the mid-century gold rush, the population has grown chiefly by excess of births over deaths. From 1861 to 1938 the increment of

[1] Official Year Book of the Commonwealth of Australia, 1939. These figures do not include the aborigines.

population increase due to net immigration was 1,332,000, or 23 per cent of the total increase. After the war of 1914-1918 immigrants arrived in considerable numbers, but with the onset of the economic depression the flow of migration was reversed; in the three years 1930-1932 there were more emigrants than immigrants. In 1933, however, the tide began to turn; there was a slight excess of immigrants. After a setback in 1935, the movement broadened, and in 1938 the net immigration rose to 9,137.

About 98 per cent of Australia's population is of British origin, and many Australians hold that Australia is the most British country in the world. Australians have no colour problem, and are unanimous in their resolve not to have any. The aborigines, who for the most part live in areas remote from white settlement, number no more than 52,000; there are only about 25,000 Asiatics; and in pursuance of the White Australia policy, on which Australian public opinion is united in a solid block, the general practice is not to permit Asiatics or other coloured immigrants to enter Australia for the purpose of settling permanently in the country.

Australia is highly urbanized; the urban areas contain 64 per cent of the total population. More remarkable, however, is the large aggregation of people in the six metropolitan cities: Sydney, Melbourne, Brisbane, Adelaide, Perth, and Hobart. These cities contain 47 per cent of the total population. Sydney, with 1,289,000 inhabitants, has the largest white population of any city, except London, in the British Commonwealth. The Australian cities are, however, laid out in streets that are between two and three times wider than the height of the houses; and the typical dwelling of the Australian city worker, skilled or unskilled, is a one-storied house, with a verandah, standing in its own garden, back from the street. It is said that the Australian instead of going into the country to live has brought the country into his cities. About 43 per cent of the houses are owned by their occupiers, and another 13.5 per cent are occupied by purchasers on the installment system. The standard of

living is high. Leisure is devoted chiefly to physical exercise, the most popular sport being surf-bathing, and at cricket, the British national game, Australia with her scanty population has for over sixty years held her own with the mother country. Material comfort has not made young Australians soft. Though no war has been fought on Australian soil, Australians have in many campaigns shown that they can wage war with an endurance and efficiency never excelled in the world's history. During the war of 1914-1918 the Australians serving overseas numbered 330,000, of whom 59,300 died.

In Australia, as in other countries of recent settlement, the age structure of the population has been favourable to high fertility. During the decade following the mid-century gold rush, the birth rate was over 42 per 1,000; and though the rate declined as the immigration of young adults slackened, it remained about 35 per 1,000 until 1888. In the following year a spectacular descent began, and by 1903 the rate had fallen to 25.5 per 1,000.

The decline was preceded by events similar to those preceding the decline in the English birthrate. In England the birth rate began to go down shortly after the prosecution, conviction, and successful appeal of Charles Bradlaugh and Annie Besant had given an enormous publicity to birth control propaganda. The defendants were prosecuted for selling an American book on contraception, Knowlton's FRUITS OF PHILOSOPHY, and their trial, which continued over four days, was widely reported and, as the present writer well remembers, roused intense public interest. The trial was one of four anti-contraceptions prosecutions occurring in 1876-1878. It was not initiated by the government; and the Lord Chief Justice, who heard the case, said in his address to the jury that "A more ill-advised and more injudicious proceeding in the way of a prosecution was probably never brought into a court of justice."

In 1888 a similar train of events occurred in Australia. Early in that year Mr. Collins, a Sydney bookseller, was prosecuted for sell-

ing Mrs. Besant's LAW OF POPULATION, a book she wrote after she and Bradlaugh had successfully appealed against their conviction in the Court of Queen's Bench in 1877. Collins was convicted and fined five guineas, but he appealed to the Full Court of New South Wales, which in December, 1888, by a majority of two to one allowed the appeal. Justice Windeyer, in giving the decision of the Court said:

> All prosecutions of this kind should be regarded as mischievous, even by those who disapprove the opinions sought to be stifled, inasmuch as they tend more widely to diffuse the teaching objected to. To those, on the other hand, who desire its promulgation, it must be a matter of congratulation that this, like all attempted prosecutions of thinkers, will defeat its own object, and that truth, like a torch, 'the more it's shook, the more it shines.'[2]

Extracts from this judgment were reprinted by birth control propagandists and distributed widely, not only in Australia and New Zealand but in Great Britain. In commenting on this case, the New South Wales Royal Commission on the Decline of the Birth-Rate in that State, observed that the "remarkable coincidence between the promulgation in 1888 of the views expressed in this judgment and the sudden fall of the birthrate in 1889 could not be considered fortuitous." The Royal Commission was appointed by the government of New South Wales in 1903 shortly after the publication of a remarkable monograph by Sir Timothy Coghlan, the State statistician,[3] who pointed out that in Australia the number of legitimate births per 1,000 married women under 45 years had fallen from 328.8 in 1888 to 235.3 in 1901, and concluded that a further decline was probable. The Commission, which, so far as the present writer is aware, was the first body appointed by any government to study the decline in the birth rate, issued its report in 1904,

[2] *Ex parte* Collins, *Law Reports,* New South Wales, Vol. IX. 1888.

[3] Coghlan, Timothy: THE DECLINE IN THE BIRTH RATE IN NEW SOUTH WALES. Sidney, W. A. Gullick, 1903.

and found that the decline was due to the deliberate interference with the function of parenthood, chiefly by contraception, but also to a considerable extent by abortion. The Commission was unable to trace the prevalence of family limitation to definite economic causes, but reported that most of the witnesses examined attributed it to "an increasing love of luxury and of social pleasures" and "a dislike of the interference with pleasure and comfort involved in child-bearing and child-rearing." The Commission's report ended with the following warning:

> In whatever way the waning birthrate in New South Wales is viewed . . . it is seen as a grave disorder sapping the vitals of a new people, dispelling its hopes, blighting its prospects, and threatening its continuance. . . . It is the duty of the present generation of Australians to see to it that their patriotism is not impugned in time to come; and that the loss of this fair heritage of the British race, which, under existing conditions, the philosophy of history foretells, is not made attributable to them by those who may, in the days to come, have to sacrifice their blood and treasure in the vain hope of defending it.[4]

In 1904, when the report of the Royal Commission was published, the Australian birthrate was 26 per 1,000. After a slow rise to 28.5 in 1912, the rate entered upon another period of decline, and in 1934 it reached the lowest figure yet recorded—16.39 per 1,000. The gradual rise to 17.7 in 1939 was doubtless due to the increase in marriages that accompanied the gradual recovery from economic depression; the marriage rate rose from 7.03 in 1933 to 9.05 in 1938.

Since 1909 the particulars required to be registered by the Australian birth registration system have included the age of the mother at the birth of the child and the order of birth, and it has been possible to compute gross and net reproduction rates on Australian data from that year. Between 1909 and 1912 the gross reproduction rate rose from 1.662 to 1.781, accompanied by a rise in the crude birth rate, and fell gradually to 1.047 in 1932-1934, a drop of 41

[4] Report of the Royal Commission on the Decline of the Birth Rate in New South Wales. Sydney, W. A. Gullick, 1904, p. 54.

Number of Children in Family	1909–1913	1929–1931
1	58	65
2	75	157
3	104	155
4	117	139
5	117	113
6	104	93
7	102	72
8	80	60
9	68	48
10	61	31
11	43	24
12	29	16
13	20	12
14 and Over	24	13

Table 1. Number out of every 1,000 children born belonging to families of different sizes according to the fertility of 1911 and 1931.

per cent. In 1935-1936 the rate was 1.048; in 1937 it rose to 1.076, and in 1938 it was 1.069.[5]

The changes in Australian fertility since 1909 have been studied by Dr. Enid Charles,[6] who concluded that the decline in fertility between 1911 and 1931 was due in about equal measure to an increase in the proportion of childless women and to a reduction in the number of large families. She estimated that the proportion of childless women was 10 per cent in the period 1909-1913 and 26 per cent in 1929-1931. The changes in family size between the two periods are of special interest. There was a slight increase in the proportion of only children, a large increase in the proportion of two-children families, and a reduction in the proportion of families of five and more children, the reduction being more and more marked with the increase in family size. The figures in Table 1 show the proportion of only children and of children from families of different sizes out of every 1,000 children born according to the fertility rates of 1911 and 1931.

[5] League of Nations Yearbook, 1939-1940.

[6] Charles, Enid: The Changing Structure of the Family in Australia. Political Arithmetic, edited by L. Hogben. London, Geo. Allen and Unwin, 1938.

It will be seen that while in 1909-1913 more children came from families of four or five children than from families of any other size, in 1929-1931 the two-children family had made a rapid advance in public favour and had in fact become more popular than any other pattern, with the three-children family as a close competitor. It is noteworthy, however, that although in 1929-1931 the small family had become more generally favoured by parents, no less than 62 per cent of all the children born were found in families of four or more children. The Australians of the future were still springing mainly from the larger families, though the proportion of such families had been considerably reduced.

The effect on population growth of the decline in fertility has been masked by Australia's exceptionally low mortality. In the five years 1934-1938, the mean annual death rate per 1,000 population was 9.45. The age composition of the population, which still contains a large proportion of young adults, accounts in part for the low level of the crude death rate, since the corrected death rate computed from the mean expectation of life at birth, which in 1932-1934 was about 65 years, was 1,000/65=15.38. But the high expectation of life, and, consequently, the low corrected death rate, which was lower than that of any other country except New Zealand and Holland, is evidence that the low level of the crude death rate must be attributed largely to the favourable hygienic conditions under which Australians live. Additional evidence is afforded by the low rate of infant mortality. In 1934-1938 the number of deaths of children under one year per 1,000 births was 40.17—a rate lower than that of any country except New Zealand. The unusually low mortality rate has retarded the descent of the net reproduction rate, which in 1911 was 1.39. In 1921 it had fallen to 1.30, and in 1931 to 1.03. In 1932 the rate appears to have fallen below unity; in 1932-1936 it was 0.95. In 1938 it rose to 0.98, still below replacement level.

The descent of the net reproduction rate below the level required for maintaining a stationary population has incited Australian de-

Number of Estimate	Maximum Population	Year in Which Maximum Reached	Population in the Year 2003
1	7,875,000	1977	7,632,000
2	7,420,000	1957	5,513,000
3	8,940,000	1981	8,462,000

Table 2. Future population of Australia according to three estimates.

mographers to examine the prospects of further population growth in their country. Mr. S. H. Wolstenholme of Sydney University has published three estimates of Australia's future population up to the year 2003.[7] The first assumes that natality and mortality will remain at the 1932-1934 level, when the net reproduction rate was 0.95. The second assumes that mortality will remain at the 1932-1934 level, but that natality will decline until 1963 at a rate equal to one-half of the rate of decline experienced during 1925-1930, so that by 1963 the net reproduction rate will fall to 0.69. Both these estimates assume that there will be no migration. The third estimate assumes that mortality and natality will be as in the second estimate, but that the population will be continuously replenished by immigration of the same volume and sex distribution that obtained during the peak pre-depression years. On this assumption the annual number of male and female immigrants would be about 27,000 and 18,000 respectively. The results of the three estimates are given in Table 2.

According to all three estimates the population of Australia will reach its maximum size within the next forty years, and will begin to decrease before the end of the century. On the assumptions of the second estimate the decrease some 50 years hence will be rapid. Even on the assumption that migration on a large scale will be maintained, the population will diminish unless the tendency of natality to decline is arrested.

[7] Wolstenholme, S. H.: The Future of the Australian Population. *Economic Record*, December, 1936.

Years	Total Population		
	Estimate A (Thousands)	Estimate B (Thousands)	Estimate C (Thousands)
1950	137,084	140,561	141,645
1960	139,457	146,987	149,372
1970	138,455	151,170	154,969
1975	136,680	152,433	156,977
1980	133,993	153,022	158,335

Table 3. Growth of the population in the United States from 1950 to 1980 according to three estimates.

It is interesting to compare Wolstenholme's figures with three estimates of future population growth in the United States made by Warren S. Thompson and P. K. Whelpton for the National Resources Committee.[8] All three estimates assume that mortality will decline until in 1980 the expectation of life at birth will be 68.8 years for males and 71.2 for females. As to fertility, Estimate A assumes that the specific fertility rates will decline until in 1980 there will be about 1,500 births per 1,000 women living to age 50. Estimate B is based on somewhat higher fertility rates. It assumes that the rates will decrease by about 13 per cent during the fifty years after 1930-1934, so that by 1980 one thousand women living through the child-bearing period will give birth to about 1,900 children, this being approximately the 1930 rate in Massachusetts, Connecticut, Washington, and Oregon. Neither estimate makes any allowance for the highly uncertain factor of migration, but a third estimate—Estimate C—was prepared based on the assumption that, while fertility and mortality will decline at the rates assumed in Estimate B, there will be a net immigration of 100,000 persons annually. Table 3 shows the growth of the population of the United States from 1950 to 1980 according to each of these three estimates.

According to Estimate A the population of the United States will reach its maximum number about 1960, and will then decline at a rate that will become well marked about forty years hence. Wol-

[8] National Resources Committee, *Problems of a Changing Population*. 1938. Pp. 22-24.

stenholme's second estimate shows a similar movement of the Australian population, and the results of his first and third estimates are not unlike those emerging from Thompson and Whelpton's Estimates B and C respectively.

Wolstenholme's estimates afford food for thought, especially when it is borne in mind that Australia's area is nearly equal to that of the United States. Opponents of the White Australia policy, who, though practically non-existent in Australia are numerous and vocal elsewhere, lay stress on the contrast between Australia's vast area and scanty population. But large parts of the "vast unpeopled spaces" of which so much has been made are desert. What proportion of the total area can be made suitable for white settlement is a question on which widely differing opinions are held. Some eminent authorities hold that the continent when fully developed would be capable of supporting 100,000,000 persons; others contend that the maximum number would be reached if the present population were doubled; and between these limits various additional estimates might be cited.[9] Though Australians differ on the question of the maximum population their country could support without any reduction in the present standard of living, they agree that it would at least be twice the size of the present population. They are also unanimous in their agreement that however desirable it may be to increase the number of Australia's inhabitants, it must not be done by permitting immigration of coloured races and, consequently, creating a colour problem in Australia. No measures have been adopted for the express purpose of checking the decline in fertility.

The disparity between Australia's resources and population is viewed with apprehension by some Australian writers, who deplore the decline in the birth rate as an influence tending to make a vain thing of any hope that Australia may take that place in the world to which from her past achievements and the high qualities of her

[9] Wadham, S. M. and Wood, G. L.: Land Utilization in Australia. Melbourne, Melbourne University Press, 1939.

people she might reasonably aspire. This view has been effectively put forward by Mr. Paul McGuire in his recent book, AUSTRALIA: HER HERITAGE, HER FUTURE. There are other writers, however, who hold a different view, who see no convincing reasons why Australia should desire a large population. They contend that the quality of a population is more important than its quantity, and that a rapid increase in population, whether by immigration or excess of births over deaths, would imperil the high standard of living that Australians have achieved and mean to maintain. This view has been expressed by Mr. W. G. K. Duncan, Director of Tutorial Classes, Sydney University:

> Only the vulgar-minded confuse mere size with greatness. Australians may be genuinely patriotic, and even enthusiastic about the future greatness of their country while admitting that our population will never be immense. Ancient Athens and modern Sweden show what can be done by people whose standards are higher than those of the ant heap.[10]

The significance of the decline in Australian fertility was first indicated by Sir Timothy Coghlan in 1903. He saw nothing incongruous in the declining fertility of old countries, especially those "afflicted with the incubus of militarism," but that fertility should rapidly decline in a new country seemed to him "novel and astonishing" and to call for the deepest attention.[11] Nearly forty years have gone by since this eminent demographer warned his countrymen of the menace of depopulation, and fertility in his country has continued to decline until the net reproduction rate has sunk below the rate required for population replacement. Declining fertility has appeared in other countries; in the United States, as in Australia, it has brought the net reproduction rate down below replacement level. We know now that declining fertility is as char-

[10] Duncan, W. G. K.: The Census and Migration. WHAT THE CENSUS MEANS. Edited by G. V. Portus. Adelaide, F. W. Preece and Sons. 1936. p. 33.

[11] Coghlan: *Op. cit.*

acteristic of new as of old countries. We know also that it cannot be attributed to the presence or absence of "militarism," since it has appeared not only in heavily-armed and warlike countries but in countries that have pursued policies of unarmed peace. It has appeared in democratic and in totalitarian countries. It is characteristic generally of the modern development of Western civilisation.

It has created problems which, though of major importance, have hitherto received but little attention from the general public. Various solutions have been put forward, but it seems that what is chiefly needed is more research into the causes and consequences of the decline, and a much wider appreciation of the momentous issues involved.

THE INFLUENCE OF PRENATAL DIET ON THE MOTHER AND CHILD[1]

J. H. Ebbs, F. F. Tisdall, and W. A. Scott[2]

During the past twenty-five years, the number of deaths in infants under one year of age has been markedly reduced. The number of deaths in the first few weeks of life, however, has been altered very little. Apart from congenital abnormalities, birth trauma and prematurity, there still remain a number of unexplainable deaths. This study was undertaken in order to determine the effect of poor and good prenatal diets upon the outcome of pregnancy and condition of infant during first months of life. Only patients who had not reached the end of the sixth month of pregnancy and those patients who signified their intention of being confined in the Toronto General Hospital were included in the study. If any major disease was found that patient was excluded.

Briefly, the method of study was as follows: (1) An analysis of the patient's food record was made at the beginning of observation; (2) this analysis was repeated two months later; (3) patients were classified into three groups, namely, those receiving a poor diet throughout, or having a supplemented diet, or subsisting on a good diet and receiving advice; (4) blood examinations were made for hemoglobin, vitamin C, and phosphatase; (5) obstetrical rating was given each patient for (a) the prenatal period, during labor and convalescence, and with respect to (b) condition of baby at birth, (c) follow-up examination of the mother, (d) ability of mother to nurse infant, and (e) the whole course of pregnancy from beginning to end of observation; (6) babies were examined at six months and at twelve months of age, and records were kept of illnesses, general condition, and eruption of teeth.

[1] Presented at the eighth annual meeting of the American Institute of Nutrition, Chicago, April 16, 1941. Reprinted from *The Journal of Nutrition*, November, 1941, 22, No. 5.

[2] Departments of Paediatrics and Obstetrics, University of Toronto, Canada.

Each patient at the first interview was given a record form containing a space for each meal for seven days. In this she was instructed to write down the kind and amount of each food eaten at each meal for seven days. She was instructed to record weights of food, where possible; otherwise, to record in common measures, such as tablespoonful, cupful, ounces, or measure of solid foods in inches, or as large, medium, or small vegetable or fruit. The patient then returned with this record and was interviewed by the dietitian. Each detail on the record was checked by means of questioning and comparison with amounts bought and amounts served at each meal to the whole family. Recipes were also discussed and methods of cooking. Social workers visited the homes of many of the patients in the Supplemented Group in order to check the consumption of the foods being sent. A trained worker visited the home of a small number of patients in each group and weighed the food after it had been estimated and recorded. Having arrived at the approximate amounts consumed, the foods were then totalled for the week under the following headings: eggs, meat (to include fish and fowl), milk, cheese, cream, butter, oil, bread (white and brown), cereals, potatoes, vegetables (cooked and raw), fruits (citrus and others), sugar, and miscellaneous. This list formed the basis for scoring the diet as "good," "fair," or "poor." A consultation was then held and with this diet record, knowledge of the family income, rent, and number of dependents, each patient was considered for further study.

If the diet was poor and the income low, each alternate patient was selected for help from a special fund.[3] Those who did not receive help were left on their poor diets, were given no dietary advice, and will be referred to as the Poor Diet Group. There were 120 in this group. Those who had been on an equally poor diet until the fourth or fifth month of pregnancy and then received extra food from us, will be referred to as the Supplemented-to-Good

[3] This fund was provided by a Toronto business man.

Calories	— 2,400–2,800	*Vitamins:*	
Protein	— 80–100 gm.	A	— 6,000 I.U.[1]
Fat	— 80–100 gm.	B_1	— 500–1,000 I.U.
Carbohydrate	— 350–400 gm.	B_2	— 3.0–3.5 mg.
Calcium	— 1.5 gm.	C	— 50–75 mg.
Iron	— 0.020 gm.	D	— 500–1,000 I.U.
Iodine	— In iodized salt	[1] International Units.	

Table 1. Nutritive factors yielded by the recommended Good Diet used in this study.

Diet Group. There were ninety of these. It was found that approximately one-half of the patients in the clinic were on moderately good diets and had sufficient income to provide a good diet if given advice. Advice in detail was then given. These will be referred to as the Good Diet Group. There were 170 of these studied.

As a basis for planning reasonable food requirements during pregnancy, we aimed at the following amounts of the essential foods: daily, 40 ounces of milk, 1 ounce cheese, 1 egg, an average serving of butter and meat, 2 servings of vegetables in addition to potato, 1 orange or one-half grapefruit or 5 ounces of tomato juice, one-half of the cereals and bread consumed to be in whole grain form, 2 teaspoonfuls of cod liver oil or equivalent in concentrate, liver once a week, salt to be iodized, and medicinal iron to be used if indicated. Two tablespoonfuls of wheat germ daily were advised. The constitution of such an average diet is given in Table 1.

We advised those patients with sufficient income in the Good Diet Group to try to obtain the amounts given in Table 1.

To the patients in the Supplemented-to-Good Group we sent daily, 30 ounces of milk, 1 egg, and 1 orange. Once a week, we also sent two 16-ounce tins of factory canned tomatoes and one-half pound of cheddar cheese. At the clinic we distributed a palatable dried wheat germ which contained malt, and added iron.[4] Two tablespoonfuls contained 12 mg. of iron. Viosterol capsules containing 2,000 International units of vitamin D were supplied, with

[4] Embryon—Scientific Foods, Ltd., Toronto.

instructions to take one daily.[5] Advice in detail was given to the women in this group regarding the use of this extra food, and instruction was given in planning the remainder of the diet from the family income.

The average cost of the extra food supplied to the ninety women in the Supplemented-to-Good Diet Group for an average period of 4.7 months was $25.00 per patient.

In order to offset any possible psychological factor due to the taking of medicine, patients not receiving supplemental food were given gelatin capsules resembling the viosterol capsules, but containing instead plain corn oil.

The additional food supplied to the patients in the Supplemented-to-Good Group gave the following daily average values: protein, 45 gm.; fat, 46 gm.; carbohydrate, 60 gm.; calories, 840; calcium, 1.45 gm.; iron, 15 mg.; vitamin C, 50-80 mg.; vitamin B_1, 350-400 I. U., and vitamin D, 2,000 I.U.

In order to eliminate errors in judgment and to offset the number of dietitians interviewing the patients, each diet record was later calculated for protein, fat, carbohydrate, calories, calcium, and iron.[6] The material was arranged in such a form that information regarding the vitamin content could also be calculated.

In Table 2, it will be noted that the Poor Diet Group and the Supplemented Group were equally low in every respect in the first record made at the beginning of the observation. The average figures of the diets of patients in the Good Diet Group are moderately good. In the second record, made about four or six weeks before confinement, the average of the diets in the Poor Diet Group is still low, although slightly increased over the first record. It will be noted that the figures in the Supplemented Group and the Good Diet Group have improved markedly, the former by supplying food, and the latter by education.

[5] Kindly supplied by Mead Johnson & Company.

[6] Figures for calculation of protein, fat, carbohydrate, calories, calcium, and iron were chosen mainly from Table 13 of APPLIED DIETETICS by Francis Stern.

		Protein Gm.	Fat Gm.	Ch Gm.	Cals.	Ca Gm.	Fe Mg.
First Record	Poor Diet	56	66	213	1,672	.537	10.7
	Supplemented—Good Diet	56	67	212	1,690	.562	10.5
	Good Diet	81	95	261	2,206	.886	14.2
Second Record	Poor Diet	62	75	232	1,837	.746	11.6
	Supplemented—Good Diet	94	111	283	2,424	1.61	24.3
	Good Diet	92	113	293	2,521	1.30	18.3

[1] All figures are per diem.

Table 2. Analysis of diets in pregnancy.[1]

Table 3 shows the percentage of patients in each group on the basis of their protein intake. The improvement in the Supplemented and the Good Diet Groups will be noted. Sixty per cent of the patients in the Poor Diet Group were taking less than 60 gm. of protein daily. Seventy-eight per cent in the Supplemented Group were getting more than 80 gm. daily after the extra food was supplied. Advice to those in the Good Diet Group about increasing the consumption of milk, eggs, meat, and cheese resulted in a sub-

Table 3. Percentage of patients in each group on basis of daily consumption of protein, calcium, and vitamin C.

	Poor Diet		Supplemented-Good		Good Diet	
	1st Record Per Cent	2nd Record Per Cent	1st Record Per Cent	2nd Record Per Cent	1st Record Per Cent	2nd Record Per Cent
Protein						
Less than 60 gm.	60	38	54	2	23	2
60 to 80 gm.	33	48	41	20	40	24
More than 80 gm.	7	14	5	78	37	74
Calcium						
Less than 0.8 gm.	81	61	86	2	46	2
0.8 to 1.2 gm.	16	28	10	10	32	37
More than 1.2 gm.	3	11	4	88	22	61
Vitamin C						
Less than 25 mg.	82	69	84	2	46	34
25 to 50 mg.	17	31	15	48	46	56
More than 50 mg.	1	0	1	50	8	10

stantial increase in the percentage who were taking a reasonable amount of protein. Thirty-six per cent of the Poor Diet Group were getting less than 0.4 gm. of calcium daily. Eighty-six per cent of the patients in the Supplemented Diet Group were getting less than 0.8 gm. of calcium daily, according to our estimated figures in the first record. The addition of milk and cheese to the diet of the Supplemented Group improved the second record greatly. All but 2 per cent were getting more than 0.8 gm. Again the effect of education was noted in the Good Diet Group, in which all but 2 per cent brought the intake of calcium above 0.8 gm. daily. The figures for vitamin C are based only upon the consumption of citrus fruits and tomatoes. They do not include any source of vitamin C in the general diet. It will be noted that the economic level of even the Good Diet Group did not allow the women to purchase more than 50 mg. of vitamin C in citrus fruits or tomatoes.

Table 4 illustrates how the poor diet in the Supplemented Group was improved as far as vitamin B_1 was concerned, by giving wheat

Table 4. Vitamin B_1 content of low income diets.

		Int. Units of Vitamin B_1
Original Diet:		
8 oz. Potatoes		100
8 oz. Bread—80% White		54
1.5 oz. Cooked Oatmeal (7.5 gm. Dry)		13
10 oz. Milk		60
2.7 oz. Meat (Beef Six Times, Pork Once)		67
4 oz. Vegetable		23
0.5 oz. Egg—¼ Egg		7
		324
Supplemented By:		
0.5 oz. Wheat Germ	100	
30 oz. Milk	180	
1 Egg	30	
1 Orange	20	
4.5 oz. Tomato	34	
Additions to Meat, Vegetables, and Whole Wheat Bread	*86*	*450*
Total		*774*

	Poor Diet	Supplemented–Good Diet	Good Diet
Number of Patients	120	90	170
Average Age	26	27	25
Average Duration of Prenatal Observation	4.4 mos.	4.7 mos.	4.4 mos.
Primipara	31%	29%	46%
Percentage of Families on Welfare Relief	44%	48%	3%
Average Value of Relief Allowance (Approximate Only)	$7.50	$8.50	—
Average Weekly Income of Families Not on Relief	$12.02	$10.94	$16.94
Average Number of Persons Per Family	3.0	3.7	2.8
Average Income Per Person	$3.34	$2.64	$6.02

Table 5. Patients in prenatal diet study—miscellaneous information.

germ, milk, egg, orange, and tomato, and by changing from white bread to whole wheat bread.

The average duration of observation in the Prenatal Clinic was 4.4 months in the Poor Diet Group, 4.7 months in the Supplemented Group, and 4.4 months in the Good Diet Group (Table 5). The economic status of the patients in the three diet groups is shown in Table 5. Three per cent of the patients in the Good Diet Group were receiving from other sources extra milk, meat, vegetables, and fruits in addition to the relief ration, which allowed them to be in the group improved by education. The past obstetrical records of the multiparous patients showed a much higher incidence of previous major complications in the Poor Diet and Supplemented Groups than in the Good Diet Group (Table 6). Those in the Supplemented Diet Group had experienced more miscarriages, stillbirths, and premature births in previous pregnancies than the Poor Diet Group.

The obstetrician in charge of the patients in the Prenatal Clinic and in the Hospital has given his rating of the condition and progress of the patient in each period of pregnancy. He was unaware of the diet group to which each patient belonged. A "good" or "fair" rating indicated that in his opinion the patient had progressed satisfactorily or with minor complications only. "Poor" or

		Poor Diet	Supplemented-Good Diet	Good Diet
Past Obstetrical History of Multiparous Patients (Per Cent of Cases):		71.4	68.7	48.9
Abortions		13.1	4.7	9.0
Miscarriages		38.1	39.0	24.4
Prematures		10.7	20.3	13.3
Stillbirths		9.5	4.7	2.2
Obstetrician's Rating During Pregnancy (Per Cent of Cases):				
Prenatal Period	Good—Fair	64	91	88
	Poor—Bad	36	9	12
Labor	Good—Fair	76	97	94
	Poor—Bad	24	3	6
Convalescence	Good—Fair	88	96	91
	Poor—Bad	12	4	9
Whole Course of Pregnancy	Good—Fair	66	94	85
	Poor—Bad	34	6	15
Complications During Pregnancy (Per Cent of Cases):				
Anemia		28.6	16.1	21.6
Preeclampsia		5.0	5.7	4.8
Toxemia		7.6	3.4	3.0
Hemorrhage—Prenatal		5.9	5.7	2.4
Threatened Miscarriage		8.4	1.1	2.4
Miscarriage		6.0	0	1.2
Premature Birth		8.0	2.2	3.0
Stillbirth		3.4	0	0.6
Hemorrhage (During Labor)		11.2	10.3	7.7
Endometritis		9.0	3.4	6.1
Mastitis		4.5	2.3	4.8
Breast Abscess		3.0	1.1	2.0
Studies of Blood During Pregnancy (All Values Are Averages):				
Hemoglobin at Term		11.5 gm.	12.1 gm.	11.9 gm.
Ascorbic Acid at Term		0.47 mg. %	0.73 mg. %	0.62 mg. %
Ascorbic Acid Cord Blood		1.0 mg. %	1.4 mg. %	1.3 mg. %
Phosphatase at Term		16.5 units	14.5 units	16.6 units

Table 6. Observations related to pregnancy.

"bad" meant that many or major complications had arisen. The

rating during the prenatal period, during the actual labor, and during the two weeks of convalescence in the hospital is shown in Table 6. The obstetrician's rating of the whole course of pregnancy from the time that the patient first came under observation in the Prenatal Clinic until she was seen six weeks after the birth of her baby is also presented in Table 6. The mothers in the Supplemented-to-Good Diet Group proved to be better obstetrical risks. The average duration of labor was five hours shorter in this group than in the Poor Diet Group. We noted a marked improvement in the general mental attitude of the patients in the Supplemented Group; many of them lost their minor aches and pains, and no longer had numerous complaints.

During the prenatal period there were more cases of anemia, toxemia, and threatened miscarriage in the Poor Diet Group, while the total number of complications in this group was almost double that in the Supplemented-Good Group (Table 6). The complications which affected the rating during labor in the Poor Diet Group were chiefly 6 per cent of miscarriages, 8 per cent of premature births, and 3.4 per cent of stillbirths, while in the Supplemented-Good Group there were only 2.2 per cent of prematures and no miscarriages or stillbirths (Table 6). After delivery there were fewer cases of uterine or breast infections in the Supplemented-Good Group (Table 6).

The effect of prenatal diet is reflected in the average levels of hemoglobin, vitamin C, and phosphatase in the blood of the mother at the time of delivery (Table 6). The average amount of hemoglobin at the time of delivery was slightly higher in the Supplemented-Good Group. The average level of ascorbic acid in the mother's blood at term and in the cord blood was proportional to the vitamin C obtained by consumption of citrus fruit and tomatoes. Phosphatase is an enzyme which has to do with the laying down of new bone. Phosphatase is increased when there are difficult or abnormal conditions in bone formation. Thus we have found

that the phosphatase of the mother's blood is more than double the average values from the sixth month to term when twins are present (Ebbs and Scott, 1940). The phosphatase in the mother's blood was appreciably lower in the Supplemented Group than in the other two groups. This became apparent from the seventh month onward after the Supplemented Group had been receiving viosterol capsules, while the other two groups had not received a source of vitamin D. This seemed to indicate that expectant mothers receiving vitamin D and an adequate diet were better able to provide for new bone in the developing fetus.

The average birth weight of the babies born of mothers in the Poor Diet Group was 7 pounds 10 ounces; in the Supplemented Group, 7 pounds 7 ounces; and in the Good Diet Group, 7 pounds 6½ ounces. The additional calories do not appear to have influenced the size of the baby.

The relation of prenatal diet to the incidence of breast feeding is shown in Table 7.

Table 7. Observations related to infancy.

Categories of Interest		Poor Diet	Supplemented-Good Diet	Good Diet
Breast Feeding in Relation to Prenatal Diet (Per Cent of Cases):				
In Hospital	Breast Feeding	81	95	88
	Artificial Feeding	19	5	12
Six Weeks After Birth	Breast Feeding	59	86	71
	Artificial Feeding	41	14	29
Principal Illnesses in Babies During First Six Months (Per Cent of Cases):				
Frequent Colds		21.0	4.7	4.7
Bronchitis		4.2	1.5	5.7
Pneumonia		5.5	1.5	0.9
Rickets		5.5	0	0.9
Tetany		4.2	0	0
Dystrophy		7.0	1.5	0
Anemia		25.0	9.4	17.1
Deaths		3	0	0

An attempt is being made to follow the progress of the babies born of the mothers in this study to determine the influence, if any, of prenatal diet upon the future condition of the baby. These observations are not completed, but a brief summary can be given of the first 250 babies followed to the age of six months (Table 7). The increased incidence of minor and major diseases in the babies born of mothers in the Poor Diet Group is quite striking. The general condition of the babies in the Supplemented and Good Diet Groups was on the whole much better. In a large proportion one could tell the diet group of the mother by looking at her baby. Two of the three infant deaths in the Poor Diet Group resulted from pneumonia, and the other from prematurity.

Summary

The prenatal diets of 400 women with low incomes were studied. One group found to be on a poor diet was left as a control, a second group on a poor diet was improved by supplying food during the last three or four months of pregnancy, and a third group, found to have moderately good prenatal diets was improved by education alone.

During the whole course of pregnancy the mothers on a good or supplemented diet enjoyed better health, had fewer complications, and proved to be better obstetrical risks than those left on poor prenatal diets.

The incidence of miscarriages, stillbirths, and premature births in the women on poor diets was much increased.

The incidence of illness in the babies up to the age of six months and the number of deaths resulting from these illnesses were many times greater in the Poor Diet Group.

Conclusion

While it is recognized that there are other important factors in the successful outcome of pregnancy, this study suggests that the

nutrition of the mother during the prenatal period influences to a considerable degree the whole course of pregnancy, and in addition directly affects the health of the child during the first six months of life.

Acknowledgments

We wish to thank the many persons who have helped in this study. Particularly we are indebted to Miss Marjorie Bell, Miss Helen Kelly, Miss Elizabeth Castle, Miss Nina Johnstone, and the obstetrical staff and nursing staff of the Toronto General Hospital.

The diet analyses and diet instruction were personally supervised by Miss Winnifred Moyle, with the assistance of her dietetic staff at the Toronto General Hospital.

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SOCIAL ENVIRONMENT AS A MODIFYING FACTOR IN THE CORRELATION BETWEEN MATERNAL AGE AND INTELLIGENCE OF OFFSPRING

PEARL MOSHINSKY[1]

THE characteristic decline in fertility of our civilization has presented problems of interest not only to the sociologist, but to all who suspect a close interaction of population numbers and cultural trends. The implications of the potential fall in real numbers depend upon an estimate of the disturbance of social equilibrium caused by a differential decline in fertility in separate groups of the population. In other words, if sections of the population reproduce at different rates, and if a real qualitative difference of any kind is associated with each section, a fundamental disturbance of the social structure may be anticipated. These eugenic fears have been implemented by the discovery of a universal sociological correlation between high fertility and low intelligence. A superficial reading of the data implies an inevitable decline in the general level of ability of a given population among whom these conditions are found to exist (1). Recently, however, more searching analysis has enabled us to view this correlation with greater equanimity. The implications of the fecundity-intelligence correlation have been modified by results obtained through controlling the socio-economic environment of the groups examined, thereby restricting the investigation of the appearance of this association to groups relatively homogeneous for social and occupational status (2, 3.) When this is done, it appears that the correlation may exist only for certain groups, and cannot be traced for others.

In a sample of 10,000 London school children (2) the most significant correlation value for intelligence and family size was found for a group of children whose parents were skilled wage-earners

[1] Instructor, Department of Sociology and Anthropology, Brooklyn College, September 1940-September, 1941. Deceased October 26, 1941.

($r = 0.27 \pm .030$), but it was non-existent for children of business owners, higher executives, and professional people. Children of unskilled workers showed a value significantly lower than that for skilled wage-earners ($r = .14 \pm .050$). These results suggest that the correlation is a function of complex factors only operative within the environment of certain social strata. Conditions causing the more intelligent to restrict their families are by no means universal to our society, and are only to be found in the presence of a set of social conditions whose value may be elucidated through further investigation. Without inquiring yet into the nature of these conditions, we may say that if they could be linked with other differentials of correlation, it would implement the view that the most productive line of inquiry into the causes of differences in human behavior lies in an analysis of factors within the social environment.

This paper is concerned therefore with an attempt to trace another influence whose effect on that form of human behavior known as intelligence may operate differentially within the socio-economic structure of society. The factor chosen here is maternal age and intelligence of child, which has not hitherto received such intensive attention as the fecundity-intelligence correlation ratio. A possible explanation for the restriction of the fecundity-intelligence ratio to a limited area of the social structure may be that this group possesses more encouraging prospects of social promotion if not burdened by large family ties. The struggle for social recognition and social mobility involves a greater expenditure on extra-family items and may therefore lead the more intelligent parent within this group to restrict his family. In this case, we might expect that within a similar group, the more intelligent mother would put off her child-bearing to a comparatively late date. If therefore we were to find the maternal-age—intelligence correlation exists only for a limited group of the population, we might infer that those factors causing intelligent parents to restrict their families may operate to produce later births. On the other hand, if the connection between maternal

age and intelligence were found to exist universally, it might suggest that certain physiological factors associated with the condition of the uterine environment at different periods in the life-cycle may be associated with the development of what we call intelligent behavior. This leads to the line of inquiry followed by such workers as Penrose (4) who has shown a relationship between variation in the uterine environment caused by age of mother, and the appearance of the pathological mental condition known as Mongolism.

The results of work hitherto undertaken in this field are conflicting and inconclusive. Thurstone and Jenkins (5) found negative results in a study of approximately one thousand individuals, when they tried to trace the influence of maternal age on intelligence of children. Steckel (6) on the other hand has shown that children of young parents in Sioux City, Iowa, are less intelligent than those of older parents. An earlier study by Holway (7), who used teachers' estimates of intelligence, gives results that are diametrically opposed to those of Steckel. Only Thurstone and Jenkins have attempted to control the socio-economic background of the sample, by selecting a group of children of skilled mechanics. Here too the results were inconclusive. The numbers however were small, since there were only 165 cases of their selected social sample. The present study has attempted a similar analysis with a much larger group of children, namely 4,000, or approximately four times that studied by Thurstone and Jenkins.

Nature of the Sample

This investigation was made possible as a result of a wider inquiry of which the writer was co-author (8, 9). In the original study, 10,000 London school children between the ages of 9.0 and 12.6 were given the Otis Group Advanced Intelligence Test, Form A, and Intelligence Quotients and Indices of Brightness were recorded for every individual.[8] All types of schools attended by chil-

[8] The use of I.Q. for a sample of varying ages has certain serious deficiencies. For the Otis Test, the raw score corresponding to the maximum mental age is 130. Thus, children

(Continued on page 50)

Type of Pupil	Number
Free Pupils In:	
Elementary Schools, Aged 9.0–11.0	2,261
Elementary Schools, Aged 11.1–12.6	1,457
Central Schools, Aged 11.1–12.6	2,026
Secondary Schools, Aged 11.1–12.6	1,038
Total Free Pupils	6,782
Fee-Paying Pupils In:	
Private Schools, Aged 9.0–12.6	728
Preparatory Schools, Aged 9.0–12.6	988
Secondary Schools, Aged 9.0–12.6	1,661
Total Fee-Paying Pupils	3,377
All Pupils	10,159

Table 1. Numbers of London pupils tested in each type of school.

dren in this age group were included, in order to obtain a representative sample of each social category (Table 1). In the original inquiry, each school category was analyzed separately, and the material was also subdivided into groups on the basis of parental occupation. For the present purpose, however, it was found more satisfactory to divide the data into the two broad groups also used in the previous studies, which represent socially distinct sections of the population. These were the category of "free pupils," which includes those children whose parents are unable or unwilling to pay for their education; and "fee-payers," all of whom make some contribution to the cost of their education. This broad division was necessary, since in the final analyses, the numbers proved too small for more elaborate school or occupational distinction.

To understand the social significance of the dichotomy, it is necessary to explain briefly the structure of the English school sys-

who exceed this score will all have the maximum mental age of 18.0 years, and their I.Q.'s consequently will vary inversely with their chronological age. For children selected on the basis of high ability, this technique is defective. In view of this, an alternative device, invented by Otis was adopted—namely, the Index of Brightness. The I.B. is a measure of the increment or decrement of an individual's score from the normal score for his age. Thus, those scoring ten points more than the norm will have an I.B. of 110, and those scoring ten less an I.B. of 90.

tem. Those children whose parents do not pay fees, attend public elementary schools up to the age of eleven, when they are subdivided as a result of a scholarship examination. Those giving the best performance become free pupils in secondary schools, subject to a means qualification. Those of the next rating, still well above average intelligence, are drafted to central schools, and the remainder stay behind in public (senior) elementary schools. At no time is any financial contribution requested or obtained from these children. Fee-paying children within the age group selected, on the other hand, attend schools privately maintained or in receipt of financial grants from the State. The former include both "preparatory" schools—i.e. those preparing for entrance to the more expensive "public" schools,[3] and "private" schools, which are of a somewhat lower social category. In secondary schools fees are required, but substantial financial aid is obtained from the Board of Education, the fees required being thus lower than those for the preparatory or private schools.

The educational system thus succeeds in dividing up the school population into well-defined social groups, which may be illustrated by analyzing the socio-economic status of the parents of each school population. Table 2 shows the percentage distribution of parental occupation for the separate types of schools attended by their children. We have already explained that to secure samples of adequate size, the separate school populations were not analyzed for maternal-age influence. Instead, only the two categories of free pupils and fee-payers were investigated, each school group being suitably weighted to reproduce the proportions of the constituent samples in the whole London school population.[4] In Table 3 a comparison of the social composition of these two groups is made. The mass of the free school population represent parents who are engaged

[3] Fees for "public" schools are higher than those of any other type, and are thus attended by children of the most privileged section of the population.

[4] The weighting device employed to obtain figures for these combined groups is explained in Gray and Moshinsky (8).

	Elementary		Central	Secondary Schools			Private	Preparatory
	9.0–11.0	11.1–12.6		Free	Fee-Payers	All		
A. *Employing and Directive Classes*								
1. Larger Business Owners and Higher Executives	—	—	—	—	13.8	8.5	29.8	27.9
2. Smaller Business Owners	1.5	2.6	3.2	2.3	—	0.9	—	—
3. Shopkeepers	6.2	7.2	4.2	4.4	11.0	8.5	8.9	3.8
B. *Professional Occupations*	0.5	0.1	0.5	2.4	14.3	9.7	13.9	29.4
C. *Minor Professional and Other Highly Skilled Occupations*	3.4	3.1	6.8	8.0	15.9	12.9	18.0	18.4
D. *Clerical and Commercial*	9.8	6.2	12.8	19.7	22.0	21.1	12.9	7.6
E. *Manual Workers*								
1. Skilled Wage-Earners	35.5	35.0	43.1	38.2	10.4	21.1	5.3	0.4
2. Unskilled Wage-Earners	26.6	30.0	18.5	14.7	2.0	6.8	—	0.1
3. Fatherless Wage-Earning Families	3.4	5.4	5.2	3.7	0.9	2.0	0.4	—
4. Total Manual Workers	*65.5*	*70.4*	*66.8*	*56.6*	*13.3*	*29.9*	*5.7*	*0.5*
F. *Occupations Unknown and Miscellaneous*	13.3	10.4	5.8	6.7	9.8	8.6	10.8	11.7
Total Numbers	1,486	1,011	2,030	1,037	1,665	2,702	729	989

Table 2. Socio-economic distribution of each school population (percentages).

in manual occupations. It will be seen that *at least* two-thirds of the total fall within this category, since a certain proportion of those whose occupations were unknown would also no doubt be included. The children of clerical workers and shopkeepers account for a further 15 per cent. The other groups are small. By contrast, only 5 per cent of the children of fee-payers have parents engaged in manual occupations, 45 per cent are the children of higher executives, large business owners, and professional persons; and a further 30 per cent are children of parents in clerical or highly skilled occupations. There is obviously some occupational overlapping, particularly in the "clerical" grade, which we know includes a wide range of positions, but generally the free school population represents the lower half of the social hierarchy and the fee-payers the upper half.

	Free Pupils (Weighted) Per Cent	Fee-Payers (Weighted) Per Cent	All Pupils (Weighted) Per Cent
A. *Employing and Directive Classes*			
1. Larger Business Owners and Higher Executives	—	24.3	2.0
2. Smaller Business Owners	1.9	—	1.7
3. Shopkeepers	6.3	7.7	6.4
4. Total	*8.2*	*31.8*	*10.1*
B. *Professional Occupations*	0.4	20.3	2.1
C. *Minor Professional and Other Highly Skilled Occupations*	3.7	17.5	4.9
D. *Clerical and Commercial Employees*	9.2	13.4	9.6
E. *Manual Workers*			
1. Skilled Wage-Earners	36.0	4.8	33.4
2. Unskilled Wage-Earners	26.6	0.6	24.4
3. Fatherless Wage-Earning Families	4.1	0.4	3.8
4. Total	*66.7*	*5.8*	*61.6*
F. *Occupations Unknown and Miscellaneous*	11.8	11.1	11.7
Total Numbers	5,564	3,383	8,947

Table 3. Socio-economic distribution of data—free pupils and fee-paying pupils.

Not all individuals in this table yielded information on maternal age. This was obtained from approximately 40 per cent of the children which materially cut down the size of the sample.

Collection of Material

The method of sampling the school population and administering intelligence tests has already been explained in previous publications (8, 9). For this inquiry, it was only necessary to collect additional information relevant to maternal age. This proved easier than anticipated, although considerable care was necessary in each case. The children were questioned individually, and were asked to supply the necessary information concerning the age of their mothers. Very few made wild guesses, and those who did were soon de-

School Population	Total Number	Knowing Maternal Age	
		Number	Per Cent Age
Elementary, Aged 9.0–11.0	2,262	918	40.6
Elementary, Aged 11.1–12.6	1,453	586	40.3
Central	2,031	891	43.9
Secondary Free	1,037	450	43.4
Secondary Fee-Payers	1,661	622	37.4
Private	729	269	36.9
Preparatory	987	415	42.0
Total	10,160	4,151	40.9

Table 4. Proportion of children knowing maternal age in each school population.

tected. On the whole, the children fell into two distinct categories—those who definitely knew their mothers' ages without hesitation, and those who could not, or would not, through a sense of propriety give the information. These were never pressed for an answer. The former group were asked how they knew, and the response provided the necessary clue for judging the correctness of the reply.

Table 4 analyzes the proportion of children in each school group originally investigated from whom information on maternal age was obtained, the proportion in all cases being roughly 40 per cent. Since the figure is slightly higher in schools containing children selected for high intelligence (central and secondary free pupils) it appears at first sight that high intelligence may be correlated with maternal age. To test this, a comparison was made of the mean intelligence of children with knowledge of their mothers' ages and the entire original sample (Table 5). The group of free pupils show almost no difference in the ratings of the two sections. The mean I.B. for all pupils in this category is 98.4, compared with 98.9 for those knowing their mothers' ages. For the fee-payers, however, there appears to be a small difference, but in view of the standard deviation, this is not statistically significant. Thus, it is unlikely that any correlation exists between intelligence and knowledge of ma-

	Index of Brightness				Intelligence Quotient			
	Free Pupils		Fee-Payers		Free Pupils		Fee-Payers	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
All Pupils	98.4	0.43	118.9	0.57	115.9	0.34	130.6	0.43
Individuals Knowing Maternal Age	98.9	0.69	120.6	0.74	115.1	0.82	131.6	0.89

Table 5. Mean intelligence of all pupils and of those knowing maternal age.

ternal age, indicating that the maternal-age data provides a sample representative of the entire group with respect to intelligence distribution.

Maternal Age Distribution

Table 6 compares the distribution of maternal ages in the two combined groups of fee-payers and free pupils. The chief difference between the two lies in the distribution over the later age groups, showing that the mode of maternal age at birth of child is lower in the socially inferior group. Fee-payers have more mothers in the 28-33 age group than free pupils, and the latter tends to be spread out among the later ages. The greater concentration of mothers of fee-payers in the age groups 22-23 is probably to be explained by the different mean family size of the two groups, that of free pupils being 4.09, compared with 2.49 for the fee-payers. In large families more births would take place at later ages than in small families, and thus

Table 6. Maternal age distribution in school populations.

Age of Mother at Birth of Offspring	Free Pupils (Weighted Percentage)	Fee-Paying Pupils (Weighted Percentage)
21 and Under	9.3	8.0
22-27	37.4	38.6
28-33	29.4	35.7
34-39	16.5	14.0
40 and Over	7.4	3.7
Total Number	2,845	1,306

we would expect a larger representation of later births for the group of free pupils.

Maternal Age and Intelligence

The distribution of the mean intelligence of children of mothers of different ages for the whole sample is shown in Table 7. These appear to be quite suggestive. Our sample shows a consistent decline in intelligence rating with increasing maternal age. The mean I.B. of children whose mothers were under twenty-one years of age at the time of their birth is almost 103. Each group of increasing maternal age shows a small but consistent decline in I.B. The last category—those with mothers over the age of 40 show the sharpest drop, but the sample is relatively small and the standard deviation large. The size of the standard deviation necessitates a cautious interpretation. Although unmistakable, the trend may not have great statistical significance. The results however may be contrasted with those of Thurstone and Jenkins, given in the last column of the table, which have been recalculated for the same age groups as those used in the present study. The latter data show no consistent tendency of the kind found at present.

The next step involved breaking up the sample into the two so-

Table 7. Maternal age and mean intelligence for total population (weighted[1]).

Age of Mother at Birth of Offspring	N	I.B.		I.Q.		Thurstone and Jenkins (Calculated[2])	
		Mean	S.E.	Mean	S.E.	N	Mean
21 and Under	363	102.9	2.3	118.7	1.8	185	73
22–27	1,542	101.4	1.1	116.4	0.9	399	75
28–33	1,370	101.3	1.3	117.0	0.9	282	76
34–39	655	99.4	1.6	115.3	1.2	135	73
40 and Over	221	95.3	2.8	113.8	2.1	44	67
Total	4,151					1,045	

[1] The statistical method employed to obtain weighted average is explained in detail in the first paper of this series, "Ability and Opportunity in English Education" (8).
[2] Means calculated from the data presented in Table XXXIV of Thurstone and Jenkins (5).

Age of Mother at Birth of Offspring	Index of Brightness						Intelligence Quotient				I.Q.	
	Free Pupils			Fee-Payers			Free Pupils		Fee-Payers		Thurstone and Jenkins Category IV[1]	
	N	Mean	S.E.	N	Mean	S.E.	Mean	S.E.	Mean	S.E.	N	Mean
21 and Under	268	101.8	2.27	95	115.2	2.88	118.0	1.8	126.8	2.4	24	79
22–27	1,047	99.6	1.13	495	120.8	1.43	115.0	0.9	131.9	0.9	65	77
28–33	894	99.5	1.30	476	120.7	1.51	115.7	0.9	131.7	1.1	46	74
34–39	464	97.2	1.60	191	123.4	2.55	113.6	1.2	134.3	1.7	23	76
40 and Over	172	93.2	2.68	49	118.8	5.14	112.5	2.0	128.1	3.4	7	82
Total	2,845			1,306							165	

[1] Means calculated from data in Table XXXVI of Thurstone and Jenkins (5). Category IV represents children of skilled mechanics.

Table 8. Maternal age and mean intelligence in socially different school populations.

cially distinct populations already referred to, namely free pupils and fee-payers. Table 8 gives a similar analysis for these separate groups. The results of the separation are interesting and suggestive. The downward trend found for the whole population still persists in the groups composed largely of children of manual workers (free pupils), but is contrasted with what appears to be a reversal in trend within the socially superior group. If we exclude the last figure on account of the smallness of sample, the differences between the mean I.B. of children of mothers under 21 and those between the ages of 34 and 39 amounts to over eight points in favor of the latter.

Table 9. Family size and mean intelligence rating in socially different school populations[1].

Number of Children in Family	Number of Pupils		Index of Brightness				Intelligence Quotient			
	Free	Fee-Payers	Free Pupils		Fee-Payers		Free Pupils		Fee-Payers	
			Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
1	707	768	108.8	1.62	121.6	1.25	122.7	1.33	131.5	0.99
2	1,438	1,226	106.6	1.05	119.8	0.94	120.7	0.87	131.3	0.72
3	1,276	748	100.4	0.99	117.5	1.12	115.7	0.82	130.0	0.87
4	933	320	98.5	1.12	117.1	1.63	114.2	0.87	129.0	1.24
5 and Over	2,120	235	91.0	0.66	117.7	2.26	109.2	0.50	130.6	1.61

[1] From Moshinsky (2).

These opposing tendencies however may be modified by the fertility-intelligence correlation found for the two groups. As Table 9 shows, both sections have an apparent tendency for high intelligence to be associated with small families, but the association is more strongly marked for the group of free pupils. The mean difference is almost nineteen points for free pupils, compared with four for fee-payers. Therefore, since larger families are associated significantly with low intelligence among the free pupils, and since children born to mothers at later ages will more probably belong to large sibships, the drop in mean intelligence found for these children may be a reflection of the fecundity-intelligence correlation.

In order to eliminate this influence, a further analysis was made, restricting the data to first-born children only. Table 10 presents the results found for this smaller sample. It now appears that the association of later births with low intelligence was indeed a reflection of the fecundity-intelligence connection for this population, since now no consistent trend is noticeable. The data for free pupils thus agrees with the results found by Thurstone and Jenkins for their entire sample of first-born children. On the other hand, our group of more privileged children retain an upward tendency for the later maternal age groups, which is perhaps even more marked than in the larger sample.

Table 10. Maternal age and mean intelligence of first-born children.

Age of Mother at Birth of Offspring	Index of Brightness						Intelligence Quotient			
	Free Pupils			Fee-Payers			Free Pupils		Fee-Payers	
	N	Mean	S.E.	N	Mean	S.E.	Mean	S.E.	Mean	S.E.
21 and Under	215	103.1	2.53	79	115.5	3.08	119.3	2.02	127.1	2.45
21–27	521	106.6	1.65	331	120.0	1.69	118.4	1.41	131.0	1.36
28–33	207	108.3	3.74	209	121.4	2.25	123.8	3.16	131.7	1.73
34–39	27	103.8	6.09	31	130.8	5.75	116.2	4.84	136.9	3.97
40 and Over	6	104.7	5.11	2	85.2	15.59	118.3	4.56	102.4	12.84
Total	976			652						

Conclusions

How are these data to be interpreted? In the first place, it appears that size of family rather than time of production is linked with intelligence of the free school population. For the fee-payers, intelligence appears to be unassociated with size of sibship, but shows some connection with period of birth. Thus, the factor determining whether an intelligent mother will produce children[8] and the time of production is a function of different social forces operative within the framework of the two groups. From the figures in Table 9 it appeared that the most intelligent children of the group largely composed of manual workers are found in small families, but there is no indication in our present analysis that these births occur early or late.

A possible explanation is that intelligent parents in this group realize the social and economic advantage of smaller families, and plan them to this end. But there appears to be no social pressure for these births to occur at any specific time. One may assume that no particular socio-economic disability is attached to producing children at one period of life rather than another. On the other hand, a social disqualification seems to be connected with early child bearing for individuals who compose the upper section of the social hierarchy. It may be that the expense of child bearing and child rearing acts as an impediment to the acquisition of those expensive appurtenances of life that mark social position and solidarity for the wealthier group of the population. Thus, child bearing would be postponed until the necessary articles that provide the accepted social framework of family life had been acquired. This also implies that the social and economic responsibilities of early child bearing

[8] This argument does not involve the concept of atomistic inheritance of intelligence from parent to child. It has already been shown in many competent studies that the type of home background provided by more intelligent adults has a direct effect in stimulating the development of the child—apart from or in addition to any "natural" intelligence the child may possess. We accept therefore the existence of a correlation between the intelligence of parent and child, without discussing in the present context the possible origins of the connection.

would impede social and occupational mobility to a greater extent among the more privileged section of the population. Secondly, differences between initial and maximum earnings are far more significant for those in professional, administrative, and business occupations than for manual workers. Manual workers reach their maximum earnings comparatively early in life, and do not anticipate any marked betterment of their economic level. Those in the higher social categories however expect considerable increments of salary or income for a long period, and this may lead to the postponement of child bearing until the higher income level has been reached.

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MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

VII. DIETS OF HIGH SCHOOL STUDENTS OF LOW-INCOME FAMILIES IN NEW YORK CITY

DOROTHY G. WIEHL

NUTRITION problems of high school students have received little attention from public health and school officials although, at these ages, children are likely to experience serious nutritional deficiencies. Dietary requirements for this age group are higher for most nutrients than at any other period of life, and an optimal intake of those nutrients which are of special importance requires careful choice of foods based on knowledge of food values. An investigation of nutritional status of a group of high school students in a low-rent area of New York City has shown that nearly all of those examined had one or more mild deficiency diseases which could be diagnosed by special tests. This investigation and the tests have been described and results on special phases have been published (1, 2, 3, 4, 5, 6). Several dietary surveys in Canada (7, 8, 9, 10) in which individual intake of food was measured showed that large percentages of adolescent children failed to consume enough of the right foods to provide for their extra food requirements. Such findings point to a need for further study of the nutritional deficiencies of high school students and also to the importance of developing measures to improve the dietary habits of this group.

Diet histories were obtained between April, 1939 and February, 1940 for over 2,000 high school pupils who were examined in the

[1] This paper is the seventh of a series from a cooperative investigation by the New York City Department of Health; the United States Public Health Service, Division of Public Health Methods; the Cornell University Medical College, Department of Public Health and Preventive Medicine and Department of Pediatrics; and the Milbank Memorial Fund.

The cooperating agencies have been assisted in carrying out this investigation by the Work Projects Administration for the City of New York, Official Project No. 65-1-97-21, W.P. 24, "Medical Evaluation of Nutritional Status."

nutrition investigation already mentioned. This Study in the lower East Side district of New York City was a cooperative investigation on Medical Evaluation of Nutritional Status conducted by the United States Public Health Service, Cornell University Medical College, the Milbank Memorial Fund, and the New York City Department of Health with assistance from the Work Projects Administration. The diet histories were collected to provide information on the level of food consumption and on dietary habits which could be used to assist in interpreting other nutrition findings. Data from these individual diet histories are analyzed for this report for the purpose of showing the frequency with which specific nutritive values in the diets were below allowances recommended to ensure good nutritional status.

Description of the Sample

The pupils in this Study were all attending a large public high school of New York City situated in the lower East Side of Manhattan. A large majority of them lived in this area, but a considerable number resided in Brooklyn and other sections of the City. The district is a low-rent neighborhood and the pupils surveyed were predominantly from low-income families. Information obtained in the home, usually from the pupil's mother, included data on family income during preceding months and on size of family. The distribution of weekly income per capita for the families is shown in Table 1. One-fourth of the families reported a weekly income of less than $4.00 per capita, 53 per cent less than $6.00 weekly per capita, and only 13 per cent reported a weekly income of $10.00 or more per capita. Eight per cent of the pupils came from families on WPA and an additional 24 per cent were from families receiving some assistance from a public or private agency, chiefly from the Home Relief Bureau or the NYA.

Both parents of about three-fourths of the pupils were foreign born, and both parents of only 5 per cent were born in the United States. Seventy-two per cent of the group were Jewish and the

Relief Status and Income	Per Cent of Total	Number
Total	100.0	2,037
Relief		
WPA	8.0	163
All Other	23.9	508
Nonrelief	68.1	1,366
Total Known Income Weekly Per Capita	100.0	1,826
Less Than $4.00	24.9	455
$4.00–5.99	28.4	519
$6.00–9.99	33.2	607
$10.00 or More	13.4	245

Table 1. Weekly income per capita and relief status of families with children for whom three or four-day diet histories were obtained between April, 1939 and February, 1940 in New York City.

majority of these were orthodox; 14.5 per cent were of Italian descent.

Description of Diet Records

Method of Collection. Diet histories used as a basis of the data presented here were collected by the interview method and were of two types: first, a history obtained by a home visitor from the mother or person who prepared the meals; second, a history taken from the child at the clinic operated by the Study.

The record taken in the home was an itemized statement of foods used by the family at each meal and between meals during the two days preceding the visit of the interviewer. The schedule used for recording this information is reproduced in Appendix I. Each food was described and homemade dishes prepared from several foods were described in detail and the recipe recorded. Quantities of each food were recorded on the schedule after careful questioning. For many items, the quantity reported was the amount purchased with added information as to how much of this amount was consumed in the two-day period. Wherever possible, units of weight or volume were obtained, as pounds or quarts, but household measures, such as measuring cups, tablespoons, etc. also were used. Packaged and

canned goods were identified by brand and price, and volume was obtained from the label, either in the home or by visiting a neighborhood store.

Individual histories for the children receiving the nutrition examination were considered essential. Therefore, the informant in the home was asked to describe as accurately as possible the share of the family food which was consumed by the child in the Study. The portions for the child were described usually in one of three ways: by units, such as two rolls, one chop, two glasses of milk; by servings, such as a sauce dish of stewed fruit, a cupful of cooked cereal; and by shares of the total family supply. In the latter case, the informant frequently indicated the number of servings obtained, and the number of these servings consumed by the child.

The diet histories taken at the Study Clinic were for a two-day period for slightly more than one-half of the pupils and were for only a day for the remainder. The schedule for the pupil record is shown in Appendix II. Since the pupil may be expected to find it difficult to give a definite idea of the size of servings, or quantities consumed, moulages[2] of measured quantities of certain items of food were displayed on the interviewers' desks, and typical cups, dishes, and bowls were also at hand. These were used as standards of reference and the pupil was asked to estimate the amounts of different foods consumed in relation to some one of the sample servings or dishes. The pupil was questioned carefully and encouraged to state whether the quantity was more or less, and how much more or less than one of the samples selected for comparison. In addition to the dietary information, the pupil was asked questions relative to his food habits and activity, including school and home work or recreation.

These diet histories, both the family and the pupil interview record, provide only approximate quantitative values of the level

[2] These models were prepared by Miss E. Lipman for the Department of Public Health, Cornell University Medical College.

of food consumption. It was not possible to obtain records for such a large number of individuals by the more accurate method of weighing the food consumed. It was decided that a good qualitative history with approximate estimates of quantity for every child would serve the purpose of the Study better than more accurate records for a few of the children. The diet histories were desired chiefly to provide data to assist in interpreting the causes of such nutritional deficiency diseases as might be diagnosed by medical tests. No deductions concerning a child's nutritional status were to be based on diet histories alone. However, wide differences in the consumption levels for individual children are indicated by these diet histories, and the quantitative estimates are sufficiently accurate to describe these differences and to classify children in broad groups according to their intake.

Method of Estimating Specific Nutrients in the Diet. For the individual diet histories obtained in the home and for those obtained from the pupil, computations were made independently for calories, protein, calcium, iron, vitamin A, thiamin or vitamin B_1, ascorbic acid, and riboflavin or vitamin B_2 in the foods.[8] However, in many cases the mother was unable to report what the child had eaten for lunch, since it was obtained at school on one or both days included in the history. In all such cases, the nutrient values of the lunches reported by the pupil were added to those computed for the food consumed at home to obtain complete two-day records, although the pupil record was for different days. Finally, the total value for each nutrient determined from the family report was combined with the total determined from the pupil report, and an average daily intake of each nutrient was calculated. The average daily values for this report are based on records for either three or four days, two days reported by the mother and one or two days by the pupil.

[8] Vitamin D content of food was not computed. Although vitamin D is essential to the nutrition of adolescents, it may be provided by exposure to sunshine as well as by foods, and information on the latter source only is of limited value.

Since there was a wide variety of foods reported, both natural and prepared, it was necessary to use food values from many sources and, in some instances, to estimate values using known values for other foods of the same general variety or, for prepared dishes, using such information as could be obtained on content. The pupils reported largely in terms of prepared dishes and, for these, recipes given by the Jewish and Italian mothers to the home visitors were used for estimating content. Food values were taken chiefly from publications of the Department of Agriculture (11), from Rose (12), Sherman (13), and Munsell (14), but other sources also were used for some values. Vitamin values determined by comparable assay methods are available for only a limited number of foods, and reported values have been expressed in different units. Vitamin A values are given in this report in International units, and values derived from tables expressed in Sherman-Munsell units were converted by multiplying by 0.7. Thiamin content of diets is given in International units of Vitamin B_1 and the Sherman-Chase unit of B_1 has been taken as equivalent. One milligram of thiamin has been counted as equivalent to 333 International units. Data on riboflavin content of foods were taken from tables giving values expressed as vitamin G or B_2 and the estimated diet values are given as Sherman-Bourquin units of vitamin G. The recommended allowances for riboflavin were converted to units of vitamin G by counting one mg. of riboflavin equivalent to 400 units, as suggested by Sherman (15).

The error in estimating the nutritive value of a diet from average values for specific food items is very large. Season, duration of storage, geographic region in which food was grown, and methods of cooking or canning affect the nutritive content. For many foods, vitamin content has not been assayed by the most reliable methods and differences between reported values often are extremely large. The magnitude of errors introduced by the average values used cannot be estimated. In spite of these limitations, nutritive values de-

rived from these dietary histories furnish useful and significant information. In the first place, the average values used for individual foods may be expected to be too high for some and too low for others and, therefore, errors are to some extent compensating. Thus, the total nutrient value calculated for a complete diet history for three or four days will have a much smaller error than the error in the nutrient values assigned to individual food items. Secondly, the same average values for specific foods are used for every record and this tends to level out or eliminate differences between individual diets which may arise from better methods of cooking or handling foods, and from seasonal or other variations in the nutritive value. In general, the process of determining total nutrient values for individual histories tends to minimize the differences between them and reveals chiefly the effect on the consumption level of differences in food choices and quantities of various food items included in the diet. The differences reflected in the nutrient estimates are those of particular significance and interest in evaluating dietary habits and the qualitative adequacy of diets.

The accuracy of the quantitative values presented in this report for individual pupils can be described as good approximations. Some records no doubt were affected by general underestimates or overestimates of the quantities of foods consumed but, on the whole, it is believed that the estimates were carefully made and were mostly of the compensating type which tend to average out in totals for a period of several days. Absolute total values for specific nutrients may be somewhat too high for some nutrients and too low for others as a result of the tables of average food values used; but differences between nutritive levels for the pupils are real and indicative of marked variation in the relative levels of consumption.

Evaluation of Adequacy of Diet

Energy Value Requirements. For each child in the Study, an estimate of the calories needed per day was calculated from body measurements and information on the amount and type of activity

of the child. From height and weight measurements, the number of square meters of surface area was read from a chart published by Dubois (16), and the basal calorie requirement per square meter per hour for a boy or girl of a given age was taken from a table prepared by Boothby, Berkson, and Dunn (17). From the pupil's report on time devoted to various pursuits during the period for which the diet history was obtained, additional calorie needs were estimated, using four levels of activity. Requirements for sedentary hours, such as meal time and classroom periods, were placed at 40 per cent more than basal; for light exercise, such as dressing and walking, at 150 per cent more than basal; for moderate exercise such as playing hand ball or working as a delivery boy, at 280 per cent; and for violent exercise, such as football, basketball, and dancing, at 600 per cent. The hours of violent exercise were conservatively estimated as only a fraction of the time spent on the football field or at a dance. The calories needed for the total energy output were added to the basal requirements for twenty-four hours and from this a deduction was made of 12 per cent of basal calories for the number of hours of sleep. This net total calorie requirement per day was increased 13 per cent to allow for digestive waste and for growth.

The average estimated calorie requirements for this group of boys and girls was: girls 13-15 years of age, 2,505 calories per day; girls 16-19 years of age, 2,389 calories per day; boys aged 13-15 years, 3,244 calories; and boys aged 16-19 years, 3,380 calories. These averages for the younger girls and the older boys are somewhat lower than the average calorie allowances recommended by the Committee on Food and Nutrition, National Research Council (18); and for the other groups are almost identical with the recommended average allowance. There were very wide differences in the estimates of calories required by the individual child. The range for girls was from 1,800 to 4,150 calories, and for boys from 1,850 to 5,350 calories per day.

Nutrient Requirements. For all nutrients, other than calories, the evaluation of adequacy in the present report is based on the daily allowances recommended by the National Research Council Committee. These allowances are as follows:

	Protein gms.	Calcium gms.	Iron mg.	Vitamin A Int. Units	Thiamin B_1–I.U.[1]	Riboflavin S-B Units-G[2]	Ascorbic Acid-mg.
Girls:							
13–15 Years	80	1.3	15	5,000	466	800	80
16–20 Years	75	1.0	15	5,000	400	720	80
Boys:							
13–15 Years	85	1.4	15	5,000	533	960	90
16–20 Years	100	1.4	15	6,000	666	1,200	100

[1] Recommendation for mg. of thiamin converted to International units of B_1 at 333 I.U. per mg.

[2] Recommendation for mg. of riboflavin converted to Sherman-Bourquin units of G at 400 per mg.

There are differences in individual requirements for these nutrients but, in view of the limited knowledge of nutritive requirements and the necessity of using approximate allowances, these recommended allowances for sex-age groups have been used as the basis for rating the adequacy of the supply of specific nutrients in the food consumed.[4] The quantities recommended provide "a reasonable margin of safety" which seems essential to assure complete and constant protection.

Nutritive Values of Reported Diets in Relation to Allowances

The percentages of pupils of each sex and in each age group whose reported diet furnished less than the allowances recommended for the corresponding sex-age group are shown in Figure 1 and Table 2 for each nutrient. In order to show the frequency of diets which were markedly deficient, there are given also the per-

[4] It has been established that the requirement for thiamin is proportional to the caloric intake, and it has been suggested that a similar relationship holds for riboflavin. Requirements for most nutrients probably vary to some extent in relation to weight or body size. An evaluation of the nutritive level of diets of these pupils on an individual basis is in progress.

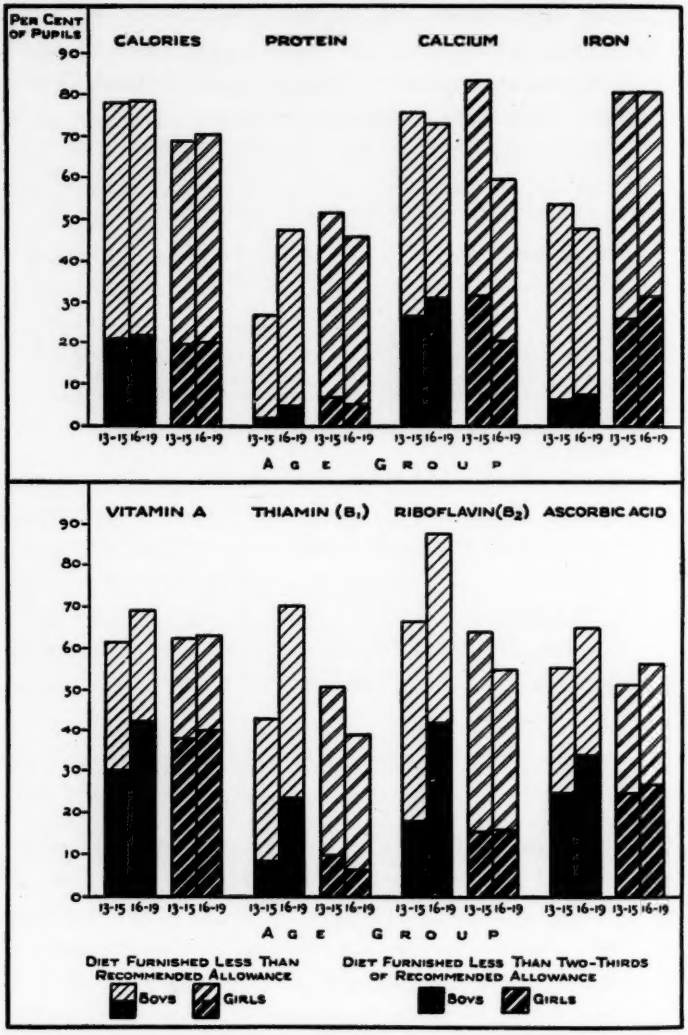

Fig. 1. Percentages of pupils whose reported diets furnished less than estimated calorie requirements and less than recommended average allowances for specific nutrients; also percentages with diets deficient by more than one-third of allowances.

Nutrient	Boys			Girls			Both Sexes 13-19 Years
	All Ages	13-15 Years	16-19 Years	All Ages	13-15 Years	16-19 Years	
	Per cent of group having less than daily allowance						
Calories	78	78	78	70	69	70	74
Protein	40	27	47	49	52	46	44
Calcium	74	75	73	71	84	59	72
Iron	50	54	48	81	80	81	64
Vitamin A	66	61	69	63	63	63	65
Thiamin (B_1)	60	43	70	44	51	39	53
Riboflavin (B_2)	80	66	88	59	64	55	70
Ascorbic Acid	62	56	65	54	51	56	58
	Per cent of group having less than two-thirds of allowance						
Calories	22	21	22	20	20	20	21
Protein	4	2	5	6	7	6	5
Calcium	29	27	31	25	31	20	28
Iron	7	6	7	29	26	32	17
Vitamin A	38	30	42	39	38	40	38
Thiamin (B_1)	18	8	23	8	10	6	14
Riboflavin (B_2)	33	18	42	16	15	16	25
Ascorbic Acid	31	25	34	26	25	27	29
Number of Pupils	1,104	404	700	933	433	500	2,037

Table 2. Percentages of pupils whose daily intake of various nutrients was less than the sex-age specific allowances and percentages with an intake of less than two-thirds of the allowances. Daily intake of pupils was based on average daily quantities from three or four-day individual histories.

centages of each group of pupils with an average daily intake which was more than one-third less than the recommended quantity.

The high percentages of boys and girls who had less than their estimated calorie requirements is a finding of considerable interest. Among boys, 78 per cent and among girls, 70 per cent were on a food-consumption level below estimates of their individual energy need. Many other studies have shown low caloric values for family food supplies. Stiebeling and Phipard (19) reported that 46 per cent of 253 families of wage-earners in the North Atlantic States had less than the estimated calorie requirements, although they spent from $2.50 to $3.12 weekly per capita; and at lower expendi-

ture levels, the caloric value of the food supply was much lower. A study of low-income families in Toronto, reported on by McHenry (7), in which the food consumed by individual members of the family was weighed, showed that the energy value of food consumed by children 11 to 18 years of age averaged only 73.9 per cent of their sex-age specific allowances. Dietary records collected in Quebec (9) for individual family members showed 65 per cent of boys and 60 per cent of girls aged 11 to 18 years were on a calorie intake below estimated needs; and in a similar survey in Edmonton (10), 64 per cent of children aged 12-18 years had diets deficient in calories. There is much evidence that low calorie diets are common among working-class families, and the question of the extent of food-energy deficiencies seems to need careful evaluation. Such diets may be expected to produce deficiencies in other elements unless the selection of foods is very wisely made.

It is clearly shown in Figure 1 that the diets of large percentages of these high school pupils furnished insufficient quantities of the various food elements. More of the children obtained the recommended allowance of protein than of any other nutrient; and the percentages of pupils having less than their allowance of protein varied from 27 per cent of the boys aged 13-15 years to 52 per cent of the girls aged 16-19 years. For all the other seven food elements considered, more than 60 per cent of pupils in one or more of the sex-age groups was supplied with less than the recommended allowance. For the group as a whole, the proportions of diets deficient in calcium, iron, and the vitamins varied from 53 per cent deficient in B_1 to 72 per cent deficient in calcium.

The frequency of insufficient amounts of a specific nutrient differed among boys and girls and for the two age groups. Thus, 80 per cent of girls in both age groups had less than the 15 mg. allowance of iron and this was the most prevalent deficiency; but among boys, about 50 per cent had less than the allowance, and iron was the least common deficiency except protein. For boys, the recom-

mended allowances for each of the four vitamins are higher for the older age group, but the intake by older boys of these vitamins was not proportionately higher, and the percentages of older boys deficient in the vitamins were higher than the percentages of younger boys. Deficiencies in vitamins were somewhat less frequent among girls than among boys; but insufficient amounts of calcium, iron, and protein were more frequent among younger girls than among boys.

An average daily intake of essential nutrients which is less than two-thirds of allowances is probably less than minimum requirements for most of these food elements. In Figure 1, it is shown that approximately 20 per cent of boys and girls in each age group had a diet which furnished less than two-thirds of their calorie need. A deficiency of more than one-third of the total allowance for vitamin A was found in 30 to 42 per cent of the diets of children in the four sex-age groups; for ascorbic acid, a deficiency of more than one-third was shown for 25 to 34 per cent of the diets; for calcium, the percentages ranged from 20 to 31 per cent. Iron in the diets of girls was more than one-third less than the allowance for 26 and 32 per cent of the younger and older girls, respectively, but this amount of iron deficiency was found for only 7 per cent of the boys. A deficiency of riboflavin of more than one-third of the allowance was found for 42 per cent of boys aged 16 to 19 years and for 16 to 18 per cent of younger boys and both age groups of girls. A similar deficiency of thiamin (B_1) was shown for 23 per cent of older boys, but for only 10 per cent or less of younger boys and of girls. The relative frequency of these deficiencies is summarized in Table 3 for each sex-age group by the rank order of the percentage in the group having less than two-thirds of the recommended allowance. Thus, the nutrient found to be deficient in the highest percentage of diets of boys aged 13-15 years is ranked 1, that in the second highest percentage of diets is ranked 2, and so forth.

On the basis of an intake of less than two-thirds of the allowance,

Nutrient	Boys 13–15 Yrs.	Boys 16–19 Yrs.	Girls 13–15 Yrs.	Girls 16–19 Yrs.
Vitamin A	1	1	1	1
Calcium	2	4	2	4
Ascorbic Acid	3	3	4	3
Calories	4	6	5	5
Riboflavin	5	2	6	6
Thiamin	6	5	7	7
Iron	7	7	3	2
Protein	8	8	8	8

Table 3. Rank order of frequency of deficiencies of more than one-third allowance.

vitamin A was the most common deficiency for all groups, and this deficiency, calcium, and ascorbic acid were three of the top-ranking four deficiencies for all groups.

Examinations on children in this Nutrition Study for the diagnosis of nutritional deficiencies have provided objective evidence that four of the dietary deficiencies shown above had produced recognizable mild deficiency conditions. The prevalence of avitaminosis A, ariboflavinosis, and of low hemoglobin values among about one-fourth of the total group have been published (5); and the prevalence of low plasma ascorbic acid levels for the total also has been reported (20). Changes in the conjunctiva associated with avitaminosis A were present in 88 per cent of 278 boys and 85 per cent of 216 girls; and 50 per cent of the boys and 48 per cent of the girls had marked thickening of the conjunctiva in one or both eyes, opacities or "spots." Invasion of the cornea by capillary "twigs" or "streamers," indicative of ariboflavinosis, was found for 76 per cent of the same groups of boys and of girls. Hemoglobin levels considered below "standard" and suggestive of iron deficiency were found for only 2.5 per cent of the 241 boys and 4.3 per cent of 184 girls. Plasma ascorbic acid levels below 0.6 mg. per cent, indicative of insufficient intake of ascorbic acid, were found for 48 per cent of 1,059 boys and 46 per cent of 1,088 girls. The high prevalence among girls of diets considered to be deficient in iron is not confirmed by their hemoglobin levels and it seems very question-

able that the allowance should be as high as 15 mg. daily. The high proportions of diets furnishing inadequate amounts of vitamin A, riboflavin, and ascorbic acid are confirmed by the medical findings.

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Record No. _____

1. Name of Head _____ Address _____

2. Name (s) of Pupil(s) in Seward Pk. (1) (2)

3. Ind. No.	4. Census of Household	5. Sex	6. Rel. to H.H.	7. Age	8. No. of Meals in 2 Days * Home a	Out b	9. Employment Occupation a	Priv. Other b	10. Wages Last Rec'd a	Usual b	Period c	11. Employment Wks. in Past 12 Mos.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

12. a. Sources of Other Income	b. Am't	c. Period	13. Annual Income (Est.)		14. Housing		
Children's Aid - Widow's Pension			Under $750		No. of rooms	Gas	Elec.
Old Age Assistance			$750 – 999		Heating: Furnace	Stoves	
Home Relief			$1,000 – 1,249		No. of rooms heated		
Priv. Ag. (*name*)			$1,250 – 1,499		Bath tub, Yes	No	
N.Y.A.			$1,500 – 1,999		Toilet: Private, Yes	No	
Relatives			$2,000 – 2,499				
Other			$2,500 or more		Amount paid for rent		

FAMILY HISTORY. 15. a. Birthplace: Father _____ Mother _____

b. Father's Fa. _____ Mo. _____ Mother's Fa. _____ Mo. _____

c. National Origin: Fa. _____ Mo. _____

d. Year to U.S.: Fa. _____ Mo. _____ 16. Height: Fa. _____ Mo. _____

Member Dead or History of Disease	17. Deaths Year	Cause of Death	Age	18. History of Diseases – For Living and Dead Persons Tuberc.	Rheumatism	Heart Dis.	Diabetes	Cancer
Father								
Mother								
Child								
Child								
Child								

19. Family member (s) now ill or suffering chronic condition (specify) _____

Informant
Date
Visitor

APPENDIX I. Record form for data obtained in the home. The schedule provides for a disease history on the pupil and other family members, for income and environmental data, and for a two-day record of foods used by the family and estimates of amounts consumed by the pupil.

	20. Persons Sharing Ind. No.	21a. Description of Food Consumed Yesterday	21b. Quantity		21c. Food Eaten Between Meals	Quantity	
			Family	Pupil		Family Excl. Pupil	Pupil
BREAKFAST	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	Ex.						
NOON MEAL	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	Ex.						
EVENING MEAL	1						
	2						
	3						
	4						
	5						
	6						
	7						
	8						
	Ex.						

APPENDIX IA

	20. Persons Sharing Ind. No.	21a. Description of Food Day Before Yesterday	21b. Quantity		21c. Food Eaten Between Meals	22. Summary of Two Day Total — Selected Foods			
			Family	Pupil		Food	Description	Quantity	
BREAKFAST	1					Milk - fluid			
	2					canned			
	3					dried			
	4					Cream			
	5					Butter			
	6					Butter substt.			
	7					Lard			
	8					Other fat			
	Ex.					Olive oil			
NOON MEAL	1					Other oil			
	2					Sugar			
	3					Flour - white			
	4					Flour - other			
	5					Cornmeal			
	6					Bread - white			
	7					Bread - other			
	8								
	Ex.								
EVENING MEAL	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	Ex.								

23a. Meat meals x weekly _____ b. Milk meals _____

24. Vitamin preparations used (or toxics)

a. Type _____ b. Brand _____

c. Taken by _____ d. Am't. _____

25. Estimated cost of food for one week: _____

26. Donated foods in past week and source: _____

APPENDIX IB

27. DIET HABITS OF CHILD

Appetite: brkfast____ Eat alone____ With family____

Appetite for lunch____ Eats at home____ Hot L.____

Buys L. at Sch. Caf.____ Other____ App. Din.____

Eats between meals: daily____ Times weekly____

Food does not eat____

Foods not liked____

Foods liked especially____

Eats meats or fish x weekly____ Eggs____

No. of glasses of milk daily____ Of water____

Citrus fruits x weekly____ Other fresh fruits____

28. HEALTH HABITS

Time to bed____ Arises____ Hrs. sleep usual____

Sleeps in room with____ Bed to self____

Reads in bed____ Radio in sleeping rm____

Movies: x weekly____ Afternoon____ Eve.____

Games or activities enjoyed____

Am't of exercise____

Fatigues easily____

29. HEALTH HISTORY OF CHILD

a. During past year

(1) Serious illness: Cause____ Month and Duration____ Days in bed____ Phys.____

(2) Serious illness: Cause____ Month and Duration____ Days in bed____ Phys.____

No. of colds____

Growth: Become taller____ More than usual____

Become more stout____ Thinner____ No change____

Weight: Any loss____ Increase____ No change____

b. Disease history (life) Give age of occurrence

Pneumonia____ Rheumatism____ Growing Pains____ Joint Pains____

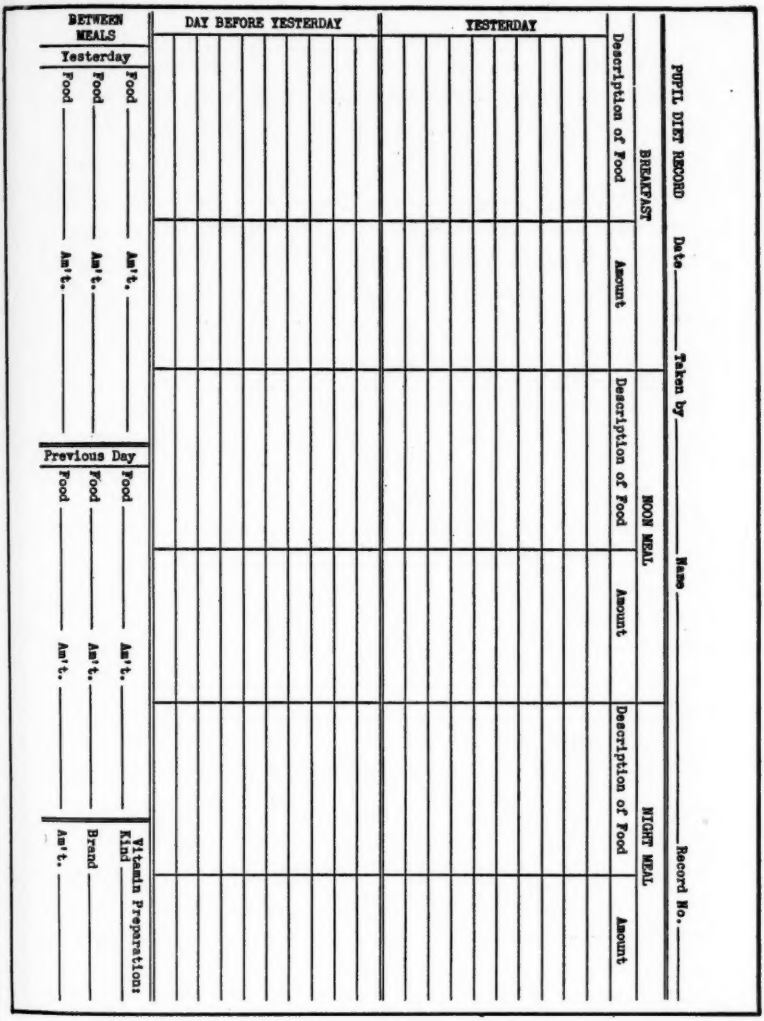
Scarlet Fev.____ Diphtheria____ Measles____

Whooping C.____ Tonsillitis____ Heart Dis.____

Prolonged or serious illness with or following any of above (explain)____

Other serious illness:____

APPENDIX IC



APPENDIX II. Record form for diet history from pupil interviewed at Study Clinic. It provides for a record of a pupil's food consumption for a two-day period.

-2-

FOOD HABITS

Yesterday's lunch: Eaten at home____ Carried____ B'ght.____ At school____ Free____

Previous day's " : Eaten at home____ Carried____ B'ght.____ At school____ Free____

Do you usually eat about the same breakfast?_____

If not, explain_____

Do you usually eat about the same amount of food, as in the past 2 days?_____

_____

Do you drink milk?_____ No. of glasses per week_____ Eggs per week_____

Kinds of fresh fruit eaten in past 7 days:_____

_____

Vegetables in past 7 days:_____

_____

Vitamin preparation: Kind_____ Brand_____ Am't._____

ACTIVITIES

Hour arose this A.M.____ Yesterday____ Hr. to bed last night____ Previous____

School exercise periods: Yest._____ Prev._____

Outdoors: Yest._____ Prev._____

Work or chores: Yest._____ Prev._____

Reading or studying: Yest._____ Prev._____

Indoors: Movie, etc. Yest._____ Prev._____

Other:_____

USUAL ACTIVITIES

School clubs_____

Other clubs_____

Athletics_____

Dancing_____

Movies_____

Other_____

APPENDIX IIA

MEDICAL EVALUATION OF NUTRITIONAL STATUS[1]

VIII. THE SCHOOL LUNCH AS A METHOD FOR IMPROVING DIETS OF HIGH SCHOOL STUDENTS

EMILY K. STAMM AND DOROTHY G. WIEHL

IT has often been suggested that the school lunch offers an opportunity to make up some of the deficiencies in the home diet of school children and to influence their food habits. The extent to which a high school cafeteria can function with respect to these two objectives is uncertain and no experimental work in this field has come to our attention. The relative frequency and extent of deficiencies of essential nutrients in diets, it is believed, afford a reasonable guide for needed modifications in dietary habits of special groups of the population. In a previous report (1), the prevalence of diets below recommended allowances for specific food elements was presented for a high school group in New York City. This information is utilized in the present report as a basis for suggestions for improving the school lunch as a source of the food values which were most commonly deficient. In New York City, a majority of students in public high schools purchase lunch in the school cafeteria, many others who carry lunch to school purchase some supplementary food, and a small group receive free lunches. Through careful planning of food items offered for sale, and some attention to making the more nutritious items attractive, psychologically and economically, the school cafeteria has an opportunity to influence the consumption level of essential food elements.

Diet histories, obtained by interview, were available for 2,037 pupils as part of an investigation on Medical Evaluation of Nutri-

[1] This paper is the eighth of a series from a cooperative investigation by the United States Public Health Service, Division of Public Health Methods; the Cornell University Medical College, Department of Public Health and Preventive Medicine and Department of Pediatrics; the Milbank Memorial Fund; and the New York City Department of Health.

The cooperating agencies have been assisted in carrying out this investigation by the Work Projects Administration for the City of New York, Official Project No. 65-1-97-21, W.P. 24, "Medical Evaluation of Nutritional Status."

Nutrient	Per Cent of Diets With Less Than Allowance[1]			Per Cent of Diets With Less Than Two-Thirds Allowance		
	All Pupils	Boys	Girls	All Pupils	Boys	Girls
Calories	74	78	70	21	22	20
Protein	44	40	49	5	4	6
Calcium	72	74	71	28	29	25
Iron	64	50	81	17	7	29
Vitamin A	65	66	63	38	38	39
Thiamin (B_1)	53	60	44	14	18	8
Riboflavin (B_2)	70	80	59	25	33	16
Ascorbic Acid	58	62	54	29	31	26
Number of Pupils	2,037	1,104	933			

[1]*See* Footnote 2.

Table 1. Percentages of pupils whose average daily intake of various nutrients was less than recommended allowances and percentages less than two-thirds of allowances for specific nutrients among a high school group in New York City.

tional Status, which was a cooperative study conducted by the Cornell University Medical College, the New York City Department of Health, the United States Public Health Service, and the Milbank Memorial Fund, with assistance from the WPA. Children in the Study were all attending a large public high school on the lower East Side of Manhattan. The method of collecting the diet records and of determining nutritive values has been described in detail (1). For each pupil, the average daily amount of calories, protein, calcium, iron, vitamin A, thiamin (B_1), riboflavin (B_2), and ascorbic acid (vitamin C), furnished by the foods reported was calculated from records of all food consumed on three or on four days.

The proportions of the pupil diets which were below recommended allowances[2] for each nutrient are summarized in Table 1. There is shown also the percentages of pupils who received less than two-thirds of these allowances, a level which probably is a minimum requirement for these nutrients.

The diets of nearly three-fourths of the pupils furnished less than

[2] Allowances recommended by the Committee on Food and Nutrition of the National Research Council were used for all food elements except calories. Individual estimates of calorie requirements were determined on the basis of sex, age, surface area, and activity.

the estimated calorie needs and almost as many were below the recommended allowances for calcium and riboflavin. The other nutrients ranked in frequency, in descending order, as follows: Vitamin A, iron, ascorbic acid, thiamin, protein.

When a deficiency of more than one-third of the recommended allowance is considered, the order of frequency of diets deficient in the different food elements is somewhat changed. Thus, vitamin A was the most common deficiency and 38 per cent of the pupils had less than two-thirds of the recommended allowance. Diets were deficient by more than one-third of allowance in other nutrients in the following order of frequency: Ascorbic acid, calcium, riboflavin, calories, iron, thiamin, and protein.

Food Values of Lunches

A special analysis was made of the food values of lunches eaten by boys and girls on school days. For this purpose, dietary histories obtained from the pupil relating to two school days were selected for boys and girls who bought lunch and who carried lunch from home. Dietary histories for either one or two days for pupils who received a free lunch at school were tabulated because of the small number of records which included two days on which the free school lunch was eaten. The average total daily intake of specific nutrients and the average quantities furnished by lunches are shown in Table 2. The average luncheon values were related to the average daily allowances for each group of boys and girls and the percentages of the total allowance [a] furnished by lunch are given in Table 2 for each nutrient.

The children most affected by the lunches served in the school obviously are those who bought lunch and those who received the free lunch, although many children who carried lunch also bought some food at school. The calorie value of the free lunches eaten by

[a] If the recommended daily allowance for a nutrient differed by age for boys or girls, the allowance used in computing these percentages was an average weighted in proportion to the age distribution of pupils in the specific type of lunch group.

Nutrient	Boys			Girls		
	Lunch Bought	Lunch Carried	Free Lunch	Lunch Bought	Lunch Carried	Free Lunch
	AVERAGE TOTAL AMOUNT PER DAY					
Calories—Number	2,811	2,920	2,602	2,169	2,001	1,895
Vitamin A—Int. Units	9,088	6,479	3,723	5,532	3,983	5,481
Calcium—Grams	1.28	1.19	1.21	0.99	0.83	0.96
Ascorbic Acid—Mgs.	92.5	96.5	67.2	83.0	72.5	72.5
Vitamin B_2—Sherman Units	1,072	929	798	756	711	928
Vitamin B_1—Int. Units	670	666	542	534	452	415
Iron—Mgs.	17.1	15.7	13.9	12.1	11.2	11.0
Protein—Grams	107.7	110.4	95.0	78.2	76.4	66.5
	AVERAGE AMOUNT PER DAY IN LUNCH					
Calories—Number	771	812	681	581	565	584
Vitamin A—Int. Units	3,446	991	1,067	1,034	782	995
Calcium—Grams	0.33	0.22	0.42	0.26	0.15	0.36
Ascorbic Acid—Mgs.	19.5	20.5	8.1	10.5	17.5	9.3
Vitamin B_2—Sherman Units	215	181	234	150	137	186
Vitamin B_1—Int. Units	159	159	139	102	98	114
Iron—Mgs.	4.35	3.69	3.97	2.73	2.53	3.36
Protein—Grams	27.6	29.5	27.5	19.3	20.6	22.5
	PER CENT OF DAILY ALLOWANCE FURNISHED BY LUNCH					
Calories—Number	24.4	25.8	21.7	23.4	24.0	24.3
Vitamin A—Int. Units	63.0	18.1	19.9	20.6	15.6	19.8
Calcium—Grams	23.9	15.9	29.7	23.7	13.6	30.0
Ascorbic Acid—Mgs.	20.5	21.6	8.6	13.1	21.9	11.9
Vitamin B_2—Sherman Units	19.9	16.8	22.3	20.0	18.3	24.2
Vitamin B_1—Int. Units	26.5	26.5	23.9	24.0	23.1	25.9
Iron—Mgs.	29.0	24.6	26.5	18.2	16.9	22.4
Protein—Grams	29.8	31.9	30.4	25.1	26.7	28.8
Number of Pupils	64	54	27	47	58	24
Number of Daily Reports	128	108	38	94	116	37

Table 2. Average amounts of various nutrients furnished by lunches and the percentages of total daily allowances for boys and girls classified according to type of school lunch.

girls was about equal to that in lunches eaten by the other girls, but boys receiving the free lunch had fewer calories than either of the other groups of boys. For all groups, except the boys with free lunches, the average lunch furnished about one-fourth of the calo-

ries required for one day. There was considerable variation in the percentages of recommended daily allowances which were furnished by the average lunches, but with a few exceptions the lunches contributed a smaller proportion of the allowances for those nutrients in which we have noted the largest numbers of children were deficient than of the allowances for nutrients less frequently deficient in the diets. The principal exception to this general situation is found for children who received free lunches and who, as a result of the milk included in the free lunch, received relatively large proportions of their requirements for calcium and riboflavin. The boys who bought lunch had a very high average value for vitamin A, but the average lunch of other groups furnished from 15.6 to 20.6 per cent of the daily allowance of vitamin A. The ascorbic acid content of the free lunch was extremely low; girls who purchased lunch also received very little ascorbic acid from their luncheon foods; and each of the other groups obtained about one-fifth of their daily allowance for ascorbic acid at lunch.

Since vitamin values and calcium are low in the home diets of such a large number of children from low-income families, it seems desirable to emphasize foods in the school cafeteria which would increase the consumption of foods rich in these nutrients. Some methods for doing this are discussed in the following section.

Suggestions for Increasing the Nutritive Values of the School Lunch

It is apparent that these deficiencies cannot all be made up by the lunch. They can, however, be greatly lessened by giving special attention to the noon meal. The purpose of this discussion is to consider how the nutritive values of food eaten at lunch time could be improved so that they would help to insure adequate, balanced diets. The foregoing information on specific deficiencies in the diets of pupils in this school and some observations made at the high school cafeteria are used as a basis for suggestions for making

the school lunches a better supplement to the home diet. The suggestions made are general, and all are not necessarily applicable to the school where this Study was made.

The emphasis in the following discussion is on measures for improving nutritive values in the school lunch. This is only one aspect of the problem and an effective program must give equal attention to education for influencing dietary habits and to the economic aspect of furnishing more of the protective foods in a school cafeteria.

It is important to keep in mind the financial background which influences the menus and food portions that can be served in a high school cafeteria. In the school where this Study was made, the cafeteria was operated on a maintenance basis, that is, without profit. About 62 per cent of the income of the cafeteria was spent for food and the non-food costs were 38 per cent of the income. At the time of this Study, surplus commodities were not available to the cafeteria and the only contributions to it were for free lunches, namely, a bottle of milk and an allowance of 6¼ cents per lunch. The cafeteria was used daily by from 2,000 to 2,500 pupils, including those who brought all or most of their lunch from home. Considerable service is required for operation of a cafeteria of this size and costs must be met for such items as refrigeration, gas and electricity, equipment, and replacement of broken china and glassware.

The purchasing power of the pupils must determine the price of food items and this, in turn, governs the types of foods and amounts offered for sale. In this school the student body is drawn from families of low income, and only about one-eighth of the pupils were from families in which the reported weekly per capita income was $10 or more. The average food check was only 6 to 7 cents, and the children who purchased all their lunch seldom spent more than 15 or 20 cents. A 10-cent hot plate was available as well as individual items, such as sandwiches, vegetables, and desserts. Most individual items sold for 5 cents a portion. Where all children have a very limited amount of money to spend, and many have only a few cents

for supplementing food brought from home, it is essential that a cafeteria provide single items at low cost. In other words, increases in the size of single portions or in the nutritive content of food items which are accompanied by higher prices per serving may reduce the number of children purchasing the more nutritious items.

It is apparent that the problem of providing lunches of high nutritive value is complex. The educational and the economic problems involved cannot be discussed in detail. However, it is believed that a consideration of foods and food values in relation to specific dietary needs can contribute toward a better understanding of the school lunch program.

A deficiency in total calories was the most frequent deficiency of any degree in the pupil diets analyzed. To increase total calories means to increase the amounts of other nutrients. Our first consideration, therefore, is suggestions primarily concerned with total calories which will also affect other dietary deficiencies.

Sandwiches are eaten by so many pupils that they provide the most consistent source of food at lunch. The kinds of sandwiches sold in the cafeteria, namely, meat, salmon, tuna fish, cream cheese and chopped egg, are all good sources of essential nutrients. They were made with rye bread, which provides definitely more value than white bread. However, the amount of filling in these sandwiches was limited. Sandwiches were secured at three different times during a period of a year and a half, and the fillings weighed. These weights were averaged and are listed below. They are compared with the weight of filling in what may be considered an average homemade sandwich of the same kind.

Kind of Sandwich	Weight of Filling Served at School	Weight of Filling in An Average Homemade Sandwich
Meat and Lettuce	20.6 Grams (¾ Oz.)	85.2 Grams (3 Oz.)
Tuna Fish	20.0 " (⅝ ")	56.8 " (2 ")
Cream Cheese and Jam	21.2 " (¾ ")	56.8 " (2 ")
Chopped Egg	25.0 " (⅞ ")	49.7 " (1¾ ")
American Cheese	36.2 " (1¼ ")	37.9 " (1⅜ ")

The American cheese filling is the only one which is comparable to the amount estimated for an average homemade sandwich. An increase in other sandwich fillings not only would improve their caloric value but also would raise other nutritive values.

When evaluating the cooked foods that may be served in a school cafeteria, the size of a portion is important. The suggestion is offered, therefore, that care be taken to see that cheaper dishes are more generously portioned than others. One food that comes to mind because it is consistently inexpensive is spaghetti with tomato sauce. A portion of spaghetti can be two or three times the size of a portion of green vegetables, and cost no more. This is also true of Spanish rice, macaroni and cheese, baked beans, and cooked lentils. One in charge of a school cafeteria should not overlook the opportunities offered by inexpensive, yet nourishing, hot dishes to provide pupils with increased calories and the accompanying increase of other essential elements. A "hot plate" might be planned to include a large portion of one of the foods named above, and a smaller portion of one or two "green" or "yellow" vegetables that may be too expensive to serve in quantity, but which will furnish an excellent source of protective vitamins.

Any increase in the consumption of milk at lunch would add significantly not only to calories but also to calcium and riboflavin values. Milk would contribute also to the vitamin A and vitamin B_1 intake. Pint bottles might be sold instead of only half-pint bottles, as at present, and the price per glass be reduced slightly. Since taking the diet records on which this analysis is based, the price of milk sold in the cafeteria has been changed from 5 cents per bottle to 1 cent in cooperation with the Surplus Marketing Administration. As a result, the average daily consumption increased from 800 bottles to 2,000 bottles of milk. This shows conclusively that many pupils will drink milk if it is inexpensive and that some will drink two glasses of milk.

Pupils who carried lunch from home often bought some addi-

tional food. A study was made of the purchases of these pupils, and it was found that of the 112 pupils, 79 bought something. Over a period of 158 school days, 154 purchases were made by the 79 pupils. The cost was 5 cents each for 122 of the purchases, while 32 cost 4 cents or less. Thus, 79 per cent of the purchases made by pupils who carried lunch were 5-cent purchases, and 21 per cent were 4 cents or less. Further analysis of these purchases shows that 80 per cent of those costing 5 cents were for milk, cocoa, and ice cream; 15 per cent were for candy and cake; 2 per cent were for orangeade, and 3 per cent were miscellaneous items. All of the purchases of 4 cents or less were for candy. The majority of pupils who could spend 5 cents preferred milk, cocoa, or ice cream. If these records had been taken after penny-milk was introduced into the cafeteria, it seems probable that children with only a few pennies to spend would have bought milk.

It is difficult to compare the purchases made by pupils who bought their entire lunch at school with those who purchased something to supplement a lunch carried from home. However, it is interesting to note that pupils who bought lunch spent a total of twice as much money for milk, cocoa, and ice cream as pupils who carried lunch, and four times as much for cake and candy as those who carried lunch. These figures show that while cake and candy were not the most popular food items in the cafeteria, they did form an important proportion of the purchases of pupils at lunch time.

Cakes and sweets presented for sale in a high school cafeteria should be selected carefully so that they will provide something in addition to calories. Below are listed some of the cakes and pastries that furnish appreciable amounts of vitamins, in addition to concentrated calories. Note that cakes that are combined with fruit, as short cakes, are good sources of all vitamins and are better in vitamin A and vitamin C than cakes combined with cream or custard. Nut cakes and oatmeal cookies are good sources of vitamin B_1 or riboflavin.

The values below are based on recipes such as would be used at home, or by a good chef. The weights of the pieces of cake listed are 2 to 4 ounces each.

Cake	Int. Units A	Micro-grams Thiamin	Mg. Ascorbic Acid	Micro-grams Riboflavin
Open Peach Cake (Fresh Yellow Peaches)	1,307	30	3	163
Peach Cake (Made with Sponge-Cake and Canned Peaches)	893	48	5	73
Banana Shortcake (Made with Sponge-Cake and Whipped Cream)	842	67	3	119
Strawberry Shortcake (Made with Sponge-Cake and Whipped Cream)	808	61	43	92
Apple Strudel	608	116	9	76
Charlotte Russe	485	18	—	53
Prune Pocket or Prune Bun	397	59	1	99
Banana Custard Tart	370	108	6	128
Cheese Cake	307	57	4	195
Boston Cream Pie	242	51	1	140
Old Fashioned Nut Loaf	195	68	—	70
Date and Nut Loaf	195	55	—	72
Cream Puff	172	30	—	75
Pecan Bun	150	47	—	75
Pineapple Upside Down Cake	147	71	7	74
Chocolate Eclair	136	40	—	75
Oatmeal Cookies Fig Newtons Fruit and Nut Cookies	} are more valuable than plain cookies.			

Special comment on the free lunch seems pertinent. It has been shown that it furnished relatively less of the calorie allowance for boys and that the average total calories in diets of the group receiving free lunch was lower than the average calories of the other pupils. In the high school studied the free lunch was definitely restricted in the fall of 1939 to a bowl of soup, a bottle of milk, and the choice of a sandwich. Some restriction in the choice of foods by pupils entitled to free lunch is necessary to prevent the choice of sweets when the need for substantial food is so great. However, to allow no substitution in the above three items can easily defeat the purpose of the free lunch.

Many pupils who receive a free lunch might be able to bring a

sandwich from home. If so, the choice of some other hot dish in place of the sandwich would greatly increase luncheon food. Also, it was noted that, although soup is always provided, pupils do not always take it. Of the 51 pupils receiving free lunch, 21 did not take soup at all, 18 took soup on one day, and 12 selected soup on two days. In other words, out of 75 free-lunch records, only 42 showed that the soup available was consumed. Apparently many pupils do not like soup. If some other hot dish, or a second bottle of milk could be substituted when the pupil does not like soup, lunch values would again be increased. A study of the kinds of soup selected shows that vegetable soup was most popular; split-pea soup and cream soups were next; tomato and tomato-rice soups were third in choice. Barley soup was selected once. No other kinds were selected at all.

The free lunch has been widely advocated as an available and efficient means for improving the dietary level of children from the lowest-income families. Free lunches were given to about 8 per cent of the pupils in the Nutrition Study, although about one-third came from families having some type of public or private assistance. However, 18.5 per cent of pupils in the Study were on NYA and most of these pupils preferred to pay for their lunches. In many schools and communities, the free lunch offers the most practical method of providing a nutritious noon meal. While each school has its own problems in the financing of free lunches, it is well to remember that there are ways of providing free lunches by using the cooperative agencies set up for just such a purpose. The Surplus Marketing Administration of the United States Department of Agriculture will make available surplus food supplies to help in providing free lunches to school children. This agency, in cooperation with WPA and NYA labor, is promoting the "Community School Lunch Program." In New York City this program has recently been expanded to include high schools. Particularly in smaller communities, Business Men's Clubs, such

as Rotary, Lions, and Kiwanis; Women's Clubs; and Parent-Teacher Associations can often be interested in such a project, especially when the youth of the immediate community will reap the benefit of their interest and cooperation.

With respect to specific vitamins, a few suggestions are offered for increasing the lunch values in vitamin A and ascorbic acid. Diets of more pupils furnished less than two-thirds of the recommended allowances for those two vitamins than for any other nutrients. Calcium, the third most prevalent deficiency of this degree, is provided best by making as much milk available as possible; and riboflavin, which was almost as prevalent a deficiency as calcium and ascorbic acid, will be increased materially not only by greater use of milk but also by measures which raise vitamin A content of diets.

An increase in vitamin A content of lunches can be achieved best by a planned use of vegetables that are rich in vitamin A. These include red and green peppers, pimentos, spinach, kale, chard, broccoli, parsley, carrots, sweet potatoes, watercress, and tomatoes. These vegetables could be used in a variety of ways to increase the amount of vitamin A in foods served in the cafeteria. Some suggestions are:

(1) Add strips of red pepper, green pepper, or pimento to salads.

(2) Fresh, green spinach leaves, or generous sprays of parsley or watercress could be substituted for lettuce in salads.

(3) The amounts of fresh tomato now used on salads could be increased.

(4) Sweet potatoes could be served two or three times a week in place of white potatoes.

(5) Broccoli, kale, or chard could be served on days when spinach is not served. One green vegetable always should be available in addition to cooked carrots or stewed or scalloped tomatoes.

(6) Add generous sprays of parsley or watercress to the meat and fish sandwiches.

(7) Add chopped cooked spinach or fresh green peppers to the chopped egg sandwich.

(8) Add chopped green or red peppers, or pimento, to the cream cheese sandwiches.

Sandwiches are a popular lunch item. Liverwurst is rich not only in vitamin A but also in riboflavin and thiamin. It could be served in sandwiches several times a week. Egg sandwiches and egg salads should be served frequently.

Citrus fruits are the best source of vitamin C. Four ounces of fresh orange juice would furnish about 55 mg. of ascorbic acid which is from two-thirds to slightly more than one-half of the total daily allowance for high school children. The orange drink served in the cafeteria was tested on several days for its ascorbic acid content, and an 8-ounce glass was found to contain an average of 17 mg. of ascorbic acid. This is the content of average orangeade. Other good sources of Vitamin C are canned grapefruit juice and tomato juice; and these are not too expensive if bought in large quantities. Fresh sliced pineapple, in season, could be served. Although it is difficult to provide good sources of vitamin C at low cost, it is not impossible to do so. A real effort should be made to replace purchases of orangeade and bottled drinks with fruit juices.

It is recognized that the availability in a cafeteria of foods rich in vitamins and minerals is not all that is required to materially lessen the deficiencies so frequently found in pupil diets. Free lunches are sufficiently controlled to make it possible to predict, quite closely, what effect any changes would make in dietary deficiencies. Pupils who have free choice of purchase must be guided to select the foods they most need, and a good educational program should be a part of any plan for improving diets. One rather obvious way of encouraging the selection of foods most needed by the average pupil is to feature them at special prices from time to time, playing on the ever-present desire to purchase as much as possible for a limited amount of money.

Again let us repeat that the writers are not unaware of the many practical difficulties that confront every school cafeteria. We also

appreciate that these difficulties are not identical, but that they vary with the locality and size of each school and with the economic status and the cultural background of the homes of the pupils. However, the problem does not seem insurmountable, if menus are planned with the advice of trained dietitians and, where necessary, community resources for various types of aid are utilized to the fullest. Dietary requirements for the high school child are high and the noon-day lunch should contribute an appreciable share of the essential nutrients.

References

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